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Downtown Troy.

INTRODUCTION

Describes the purpose of this CIP and presents U.S. EPA's community outreach objectives.

The U.S. Environmental Protection Agency prepared this **Community Involvement Plan**, or **CIP** to engage and support the **community** affected by the East Troy Contaminated **Aquifer**, or **ETCA**, **Superfund** site located in Miami County, Ohio. This CIP was created in conjunction with a separate CIP for another Superfund site in Troy, the West Troy Contaminated Aquifer site. These two CIPs contain similar information in several sections because both sites are in the same city and the community interviews for each site were conducted together. We prepared two CIPs, instead of a single combined plan to help the public distinguish each site and to more effectively conduct outreach efforts. Our **community involvement** endeavor is committed to promoting effective and meaningful communication between the **public** and the Agency. We want to make sure the community's current concerns and information needs for each of these two sites are kept separate as activities progress.

This **CIP** was prepared to support environmental and **cleanup** activities at the East Troy Contaminated Aquifer site. We used several information sources to develop this plan, including research, discussions

U.S. EPA's community outreach objectives:

- Assist the public in understanding the decision-making process during project design and cleanup and the community's role in that process.
- Give the public accessible, accurate, timely and understandable information about the project as it moves forward.
- Ensure adequate time and opportunity for the public to give informed and meaningful input and for that input to be considered.
- Reflect community concerns, questions and information needs.
- Respect and fully consider public input throughout the entire process.

*(Words in **bold** are defined in Appendix A.)*

with community members, information gathered at meetings and community interviews. We conducted interviews with residents and local officials interested in the site activities and cleanup efforts from December 15 to December 17, 2015. We spoke with over 35 people in order to develop this plan.

This CIP describes U.S. EPA's plan for addressing concerns and keeping residents informed and involved in investigation and cleanup activities at the site. We will use this document as a guide to involve and communicate with residents, businesses and the local governments in Troy and Miami County.

If you are interested in submitting comments or have questions or suggestions concerning this CIP, please contact:

Adrian Palomeque

Community Involvement Coordinator

U.S. EPA Region 5

312-353-2035

palomeque.adrian@epa.gov

“Meeting with and talking to residents form the foundation for a positive and productive relationship between the community and the U.S. EPA.”

Brief Overview of the Site

The *East Troy Contaminated Aquifer* site is an area located above **groundwater** contaminated with **volatile organic compounds**, or **VOCs**, specifically **trichloroethene**, or **TCE**, and **tetrachloroethene**, or **PCE**, in a neighborhood on the east side of Troy, Ohio. (See *Appendix F* for more information about these **contaminants**.) **Contamination** has also been found in the city of Troy's East Wellfield, but it is well below levels considered to be a health risk. The East Troy neighborhood encompasses a relatively old residential, industrial, and commercial portion of

the city. Most of the residences within the 20-block area are more than 60 years old. Sampling of gas in the soil beneath neighborhood buildings as well as air inside them confirmed that the VOCs are moving up through the soil and into the structures through cracks in foundations. This process is called **vapor intrusion**. In response, U.S. EPA installed systems to remove the vapors from 16 homes and one school. The site was placed on the **National Priorities List**, or **NPL**, in 2008 making it eligible for investigation and cleanup under the Superfund Program. More information about the site can be found on Pages 18 to 21.

The CIP is a working document that will evolve as the investigation and cleanup process continues and input is received from the community. It is intended to be flexible, adaptable and used as a guideline for our communication with the community.

Community Engagement is Essential to the Success of Superfund Cleanups

Ongoing input and involvement by the community is essential to our efforts to provide effective **community engagement**. We have learned that its decision-making ability is enhanced by actively seeking input and information from the community. Community members need to be involved in all phases of the cleanup so that the contamination is addressed in a way that protects people and the environment – now and in the future.

Residents, business owners and local government officials may be able to provide valuable information about a hazardous site that can help us determine the best way to clean it up. Information can help determine the location of contamination, how people may be exposed to the contamination and perhaps sources of the contamination.

Local residents and officials of the city of Troy and Miami County educated U.S. EPA about their community. They told us about past activities at the site and explained their concerns including concerns about potential health problems associated with drinking contaminated groundwater and potential vapor intrusion. They also mentioned the potential impacts the site could have on development projects in the community; and the potential effects the East Troy Contaminated Aquifer site specifically could have on selling property in the East Troy neighborhood. These and other concerns are explained in the Community Concerns and Questions section.



U.S. EPA Community Involvement Coordinator Adrian Palomeque, left, talks with Linda Jolly, right, Director of the Hayner Cultural Center.



U.S. EPA representatives met with residents and local officials interested in the site activities and cleanup efforts at the Hayner Cultural Center, pictured here.

COMMUNITY INVOLVEMENT GOALS AND ACTIVITIES

Highlights U.S. EPA's goals, activities and time line to keep residents and local officials informed and involved.

When establishing the objectives for a site-specific community involvement program, we consider several factors, including federal requirements and U.S. EPA policy that assess the nature and extent of known or perceived site contaminants and known community concerns and requests.

To be effective, our community involvement program is designed to meet the community's need to know, give information in a timely manner and accommodate the community's interests and its willingness to participate in decision-making processes. We must also share information in language the public can understand.

To meet the needs of the community and to respond to information obtained during community interviews and meetings, and to meet federal requirements, we have established the following objectives for our community involvement efforts:

- Enlist the support, coordination and involvement of city of Troy and Miami County officials and community leaders.
- Enlist the support, coordination and involvement of Ohio EPA.
- Monitor citizen interest in the site and respond accordingly.
- Keep the community well informed of ongoing and planned site activities.

- Explain technical site activities and findings in an understandable format for residents.
- Get public input on key decisions.
- Change planned activities, where warranted, based on community input.
- Update U.S. EPA's websites regularly and provide useful information on it for the community.
- Update city of Troy and Miami County officials on a periodic basis even if no activities are occurring at the site.
- Hold **public meetings**, when necessary, within the community to give all residents an opportunity to attend.

U.S. EPA has or will put in place the activities described on the following pages to meaningfully and actively engage the community in decisions regarding the cleanup of the East Troy Superfund site. The following plan is intended as opportunities for communication between the community and U.S. EPA and to address key concerns and questions raised during the community interviews and meetings conducted in December 2015.

Specific Community Involvement Activities

To address community concerns and questions described in the Community Concerns section, U.S. EPA has conducted (or will conduct) the activities described below. Through these activities, it is our goal to inform, involve and engage the community during site cleanup decisions and efforts. As the needs of the community change, we will modify the community involvement strategies to address them.

- **Maintain point of contact.** Adrian Palomeque is the primary liaison between U.S. EPA and the city of Troy and Miami County communities. Mr. Palomeque serves as the point of contact for community members and fields general questions about the site. For technical site issues, Mr. Palomeque coordinates with U.S. EPA's **remedial project manager**, or **RPM** for the site. Shari Kolak is the RPM for the East Troy site.

We will include current contact information for the project staff on all written and electronic information and will notify the community of any contact information changes.

U.S. EPA has designated the following people as primary site contacts for local residents:

Adrian Palomeque

Community Involvement Coordinator

312-353-2035

palomeque.adrian@epa.gov

Shari Kolak

Remedial Project Manager

312-886-6151

kolak.shari@epa.gov

They can also be reached weekdays toll-free at 800-621-8431 from 9:30 a.m. to 5:30 p.m.



- **Establish a toll-free number for residents to ask questions and receive information.** Mr. Palomeque (ext. 32035) and Ms. Shari Kolak (ext. 66151) are located in the Chicago office and can be reached using the toll-free number listed in the box at left. Ask for them by name or use the telephone extensions listed above. Residents can call these numbers as questions or concerns arise instead of waiting for a public meeting or to receive written information. We will provide the toll-free number periodically in local newspaper advertisements and include the toll-free number in all fact sheets and all of our other communications with the public.
- **Maintain communication with local officials, agencies and community residents.** We interviewed local officials from the city of Troy and Miami County. They indicated that they would like to be contacted with updated site information on a periodic basis so that they can keep their constituents informed. We will continue to maintain communication with the local officials throughout the remainder of the cleanup process. We also interviewed community residents and will continue to update residents on the progress at the site.

- **Share site information on the Internet.** We will provide information on activities and past communications for the site on the following U.S. EPA website. The website will be updated as events occur.

www.epa.gov/superfund/east-troy-aquifer

- **Update and maintain the site mailing list.** We have established a mailing list of local residents, organizations, businesses and officials for the site. This list will be used for mailing fact sheets, site updates, invitations to public meetings and events and other site-related information mailed to the community. We will update the list regularly to reflect address changes and changes in elected officials and to add new people interested in site activities.

We use the site mailing list to distribute written information such as fact sheets and meeting notifications. This is a way to ensure that those that do not have access to the Internet or other information sources still have a way to receive information directly about the site and are notified about important meetings. The mailing list is for U.S. EPA use only and is not shared with outside entities. If a community member is interested in being placed on the mailing list they



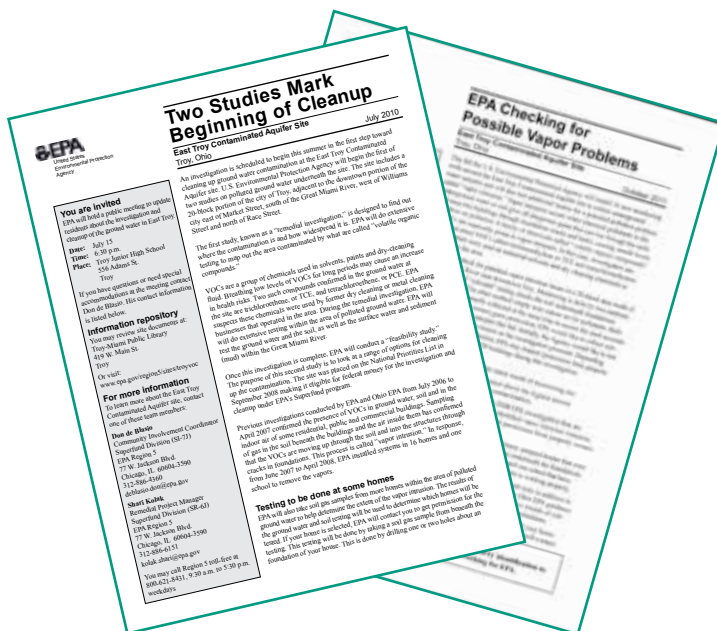
Troy-Miami County Public Library, local history branch.

can contact Adrian Palomeque, the Community Involvement Coordinator, or **CIC**, for the site.

- **Prepare and distribute fact sheets and site updates.** We will prepare and distribute fact sheets, letters and site updates to those on the site mailing and e-mail lists summarizing current information about the site and describing upcoming activities. These documents are written in non-technical language and typically done to coincide with important site activities.

We use these types of documents to give the community detailed information in a relatively quick, simple and easy-to-understand manner. In addition to being shared with individuals on the site mailing list, we also place the fact sheets and site updates in the **information repository** and post them on U.S. EPA's website:

www.epa.gov/superfund/east-troy-aquifer/



- **Establish and maintain a site-specific information repository.** We have set up a local information repository for the site at the following location:

Troy-Miami County Public Library
Local History Branch
100 W. Main St.
Troy, OH 45373

The repository is a reference collection of site information available to the public for reading and photocopying. Documents include fact sheets, technical reports, the CIP, general Superfund information and other documents. U.S. EPA adds new documents about the site as the documents become available. Information repositories give residents local access to site information in forms that can be easily read and photocopied for future use. An online information repository is also available on the site's web page

www.epa.gov/superfund/east-troy-aquifer
for the community to access information electronically.

- **Establish and maintain the administrative record.** A copy of the **Administrative Record** for the site can be found at the library listed above and at the U.S. EPA Region 5 Superfund Record Center in Chicago (*see Appendix B*). We will update the Administrative Record as necessary. The Administrative Record gives residents a paper trail of all documents U.S. EPA relied on, or considered, to reach decisions about the site cleanup.

- **Conduct public meetings, hearings and information sessions.** A public meeting is an opportunity for U.S. EPA to present specific information and a proposed course of action. U.S. EPA staff is available to share information and answer questions. A public meeting is not a formal public hearing where testimony is received. Instead, it might be a meeting to exchange information or comments. In addition, we may hold an informal open-house style meeting, called an availability session, where residents can meet U.S. EPA experts one-on-one to discuss the activities at the site. Either type of meeting allows community members an opportunity to express their concerns and ask questions of the Agency, state or local government officials. Public meetings or availability sessions can be held at various times throughout the investigation and cleanup process. We typically schedule a meeting when there are technical milestones or the community has expressed an interest in having a meeting.

A public hearing is a formal meeting where we hear the public's views and concerns about a U.S. EPA action or proposal. There are specific regulations about when the Agency is required to consider such comments when evaluating its actions. Public hearings are recorded by a professional transcriber and become part of the administrative record. The comments are also posted on the Web.

U.S. EPA will consider conducting additional meetings at different times and different locations throughout the community to give all residents an opportunity to attend as needed.

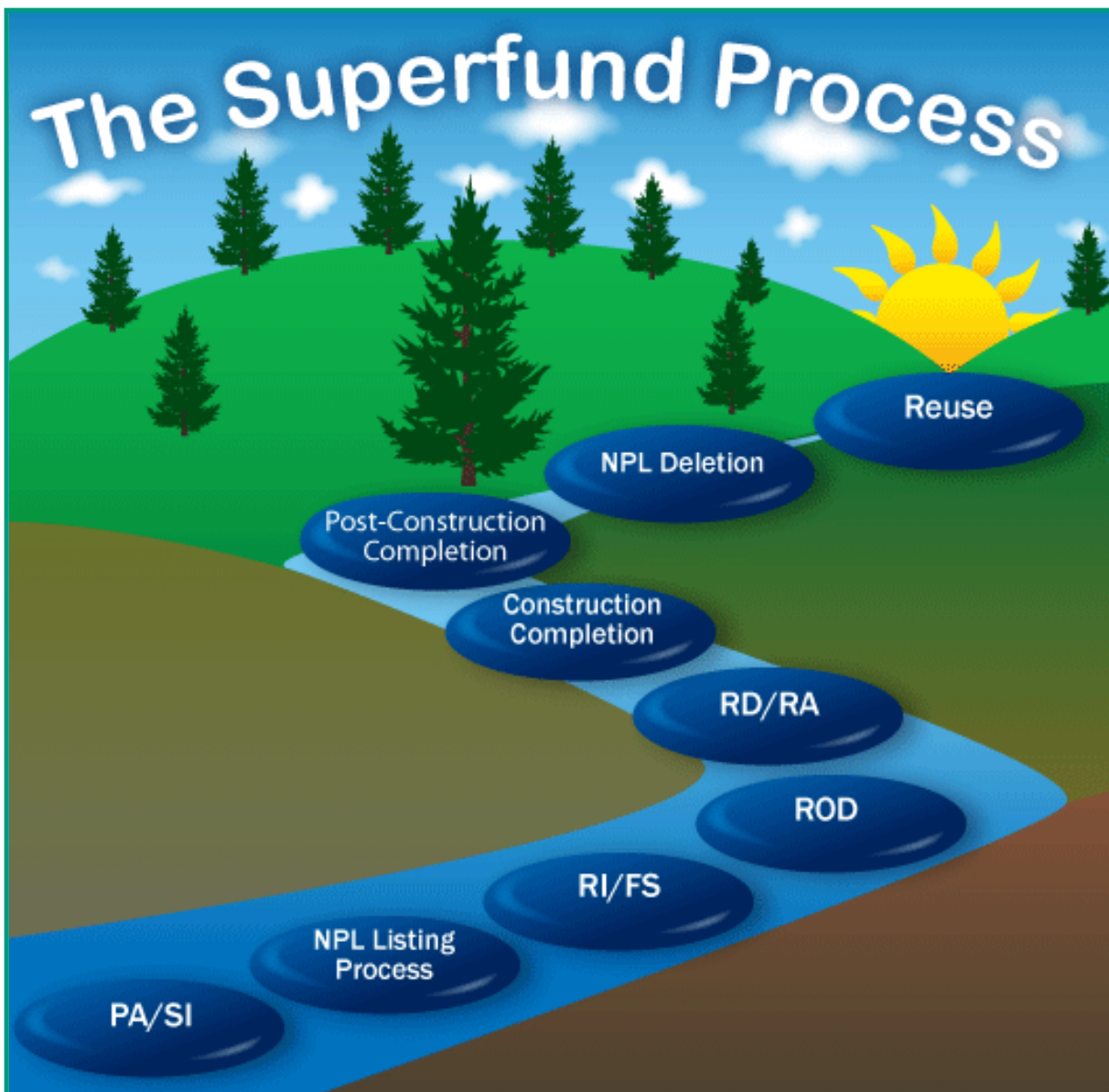
- **Assist the communities in forming a community advisory group.** A **community advisory group**, or **CAG**, is made up of local residents and provides a formal mechanism for community members to have a voice in decisions. U.S. EPA encourages the formation of CAGs. CAGs are eligible for technical assistance and funding to help residents more fully understand the technical aspects of environmental investigations, sampling data and interpretation of results and potential health risks. CAGs assist us in making decisions on how to clean up sites. You can find more information on CAGs at www.epa.gov/superfund/community-advisory-groups. If requested by the community, U.S. EPA can hold a meeting to present information on how to form a CAG.
 - **Write and distribute news releases and public notices.** We will prepare and release announcements to the local newspaper such as *The Troy Daily News* to share information about events such as significant site investigation findings, **public comment periods**, public meetings and completion of major milestones such as the proposal of a cleanup plan. We will also provide this information to the city of Troy and Miami County for posting on their respective websites.
- News releases allow us to reach large audiences quickly. We will also post the news releases on the website, www.epa.gov/superfund/east-troy-aquifer.
- U.S. EPA will issue news releases and public notices as site activities progress. We will also put copies of the news releases and public notices in the site's information repository.
- **Provide additional tools for communities as needed.** There are additional programs that can be helpful to the community if there is a need for them. Two of these programs are the Technical Assistance Services for Communities, or TASC, and the Technical Assistance Grant, or TAG. The TASC program supplies communities with technical help so they can better understand the science, regulations and policies of environmental issues and U.S. EPA actions. TAGs provide money for activities that help communities participate in decision making at eligible Superfund sites.

A Community Advisory Group, or CAG, is made up of representatives of diverse community interests. Its purpose is to provide a public forum for community members to present and discuss their needs and concerns related to the Superfund decision-making process. A CAG can assist U.S. EPA in making better decisions on how to clean up a site. It offers U.S. EPA a unique opportunity to hear-and seriously consider-community preferences for site cleanup and remediation. However, the existence of a CAG does not eliminate the need for the Agency to keep the community informed about plans and decisions throughout the Superfund process.

- **Evaluate community involvement and outreach efforts and make adjustments as warranted.** This CIP was designed to consider site- and community-specific factors as well as to comply with federal requirements. Within this CIP, community concerns, the objectives of the community involvement program for the site and the specific activities to address these concerns were based on information obtained during interviews with local residents and county, township and city officials. We recognize that changes in areas such as community perceptions, information needs and population demographics can occur over time and that such

changes may necessitate a revised approach to conducting community involvement activities. For this reason as well as to determine whether the activities in this plan are achieving their intended objectives, we will conduct periodic reviews to determine whether additional activities are warranted or whether changes to current methods of starting up the activities outlined in this plan are necessary. As the needs of the community change, we will modify the community involvement strategies to address them in a CIP revision.

The following page presents the status of the activities referred to in this section.



*Illustration of the main stages in the Superfund process from **Preliminary Assessment/Site Inspection**, or PA/SI, to site Reuse. For additional information about each of these stages look at Appendix A and Appendix E of this CIP.*

Status of Community Involvement Activities

Community Involvement Activities		Status	
Maintain point of contact	➡	✓	Adrian Palomeque 312-353-2035 palomeque.adrian@epa.gov
Establish a toll-free number	➡	✓	800-621-8431, Ext. 32035
Conduct community interviews and develop Community Involvement Plan	➡	✓	Community Involvement Plan 2017 (interviews in 2015)
Maintain communication with local officials, agencies and community residents	➡	🔄	Ongoing
Share site information on the Internet	➡	✓🔄	– www.epa.gov/superfund/east-troy-aquifer – Update as needed
Update and maintain site mailing list	➡	✓🔄	Completed - update as needed
Prepare and distribute fact sheets and site updates*	➡	✓🔄	– Aug. 2006 - Vapor Intrusion – July 2010 - Vapor Intrusion – Oct. 2011 - Site Update – Prepare as needed
Establish and maintain a site-specific information repository	➡	✓🔄	– Troy-Miami County Public Library Local History Branch 100 W. Main St., Troy – Update as needed
Establish and maintain the administrative record	➡	✓🔄	– Troy-Miami County Public Library Local History Branch 100 W. Main St., Troy – Update as needed
Conduct public meetings, hearings and information sessions*	➡	✓🔄	– Oct. 25, 2006 – July 14, 2010 – Oct. 19, 2011
Write and distribute news releases and public notices	➡	🔄	– Aug. 24, 2006 - Media Briefing – Sept. 19, 2007 - NPL Proposal – Sept. 3, 2008 - NPL Placement – Ongoing
Evaluate community involvement and outreach efforts and make adjustments as warranted	➡	🔄	Ongoing

Community Involvement Efforts

The graphic on the opposite page shows the types of community involvement activities U.S. EPA organizes at a site and how they follow along with the investigation and cleanup process. The following is a list of past community involvement activities at the sites:

East Troy Site

- **August 2006** - U.S. EPA prepared a fact sheet explaining testing and results of the vapor intrusion testing. U.S. EPA also posted the fact sheet information on the website.
- **August 24, 2006** - U.S. EPA prepared a press release announcing a media briefing about the status at the site. The briefing was held on August 25.
- **October 25, 2006** - U.S. EPA held a public meeting to update residents on its investigation of chemical pollution underneath sections of Troy, Ohio. The meeting was held at Van Cleve School. A press release was sent out announcing the meeting.
- **December - 2006** - U.S. EPA prepared and distributed a letter offering residents an opportunity to have their homes tested for the presence of vapors.
- **September 19, 2007** - U.S. EPA prepared a press release announcing the proposal of the site to be placed on the National Priorities List. The public comment period on the proposal was announced.
- **September 19 - November 19, 2007** - U.S. EPA held a 60-day public comment period on the site being proposed for the National Priorities List.
- **September 3, 2008** - U.S. EPA prepared a press release announcing the placement of the East Troy site on the National Priorities List.
- **September 21, 2009** - U.S. EPA met with the city of Troy to update them on the status of the site investigation.
- **July 2010** - U.S. EPA prepared and distributed a fact sheet explaining the vapor intrusion testing as well as an investigation of the area groundwater, soil and surface water called a **remedial investigation**, or **RI**.
- **July 15, 2010** - U.S. EPA held a public meeting to explain vapor intrusion testing as well as the testing of the area groundwater, soil and surface water. U.S. EPA announced the meeting in a fact sheet and in an advertisement the Agency placed in the *Troy Daily News*.
- **October 2011** - U.S. EPA prepared and distributed a fact sheet explaining the status of the investigation. It also announced the October 19 public meeting. The fact sheet was also placed on the U.S. EPA website.
- **October 19, 2011** - U.S. EPA held a public meeting explaining the status of the site investigation. The public meeting was announced in a fact sheet mailed to area residents and placed on the U.S. EPA website.
- **May 11-13, 2010** - U.S. EPA CIC met with residents and officials of Troy to discuss the status of the site.
- **December 15-17, 2015** - U.S. EPA CIC conducted community interviews with residents city officials to develop a CIP.
- The U.S. EPA website is updated regularly.

THE COMMUNITY

Provides a brief summary of the composition and history of the city of Troy and Miami County.

Community Profile

Troy

The city of Troy was established in 1808, and is the seat of Miami County. Because the city is located on the Great Miami River and the Miami and Erie Canal, the city grew fast. The Miami and Erie Canal was complete in 1845 and Troy was able to take advantage of the canal to ship goods to and from the city. By 1846, the city was flourishing with churches; two newspapers; a private school; numerous warehouses, flour mills and sawmills; a Masonic Hall and other factories. The railroad reached Troy in 1853 adding to the city's ability to conduct trade and business in other cities. In 1890, the population had grown to 4,590 people. Troy became a center in agricultural trade with access to area farms as well as the canal and the railroad. Later, two major interstate highways —I-75 north and south and I-70 east and west—connected Troy to even more cities and towns. Today, Troy has many manufacturing facilities and businesses, and area residents have access to jobs in the nearby cities of Dayton and Springfield as well as Wright-Patterson Air Force Base.

Source: http://www.ohiohistorycentral.org/w/Troy,_Ohio



The Masonic Temple in Troy.



Charming buildings fill the square in downtown Troy.

Governmental structure

The city of Troy has a mayor-council form of government. The mayor and council members are elected. The mayor is the chief executive officer for the city and is employed by the city full time. The council is responsible for preparing and enacting city resolutions and ordinances and meets the first and third Monday of every month.

Source: <http://www.troyohio.gov/>



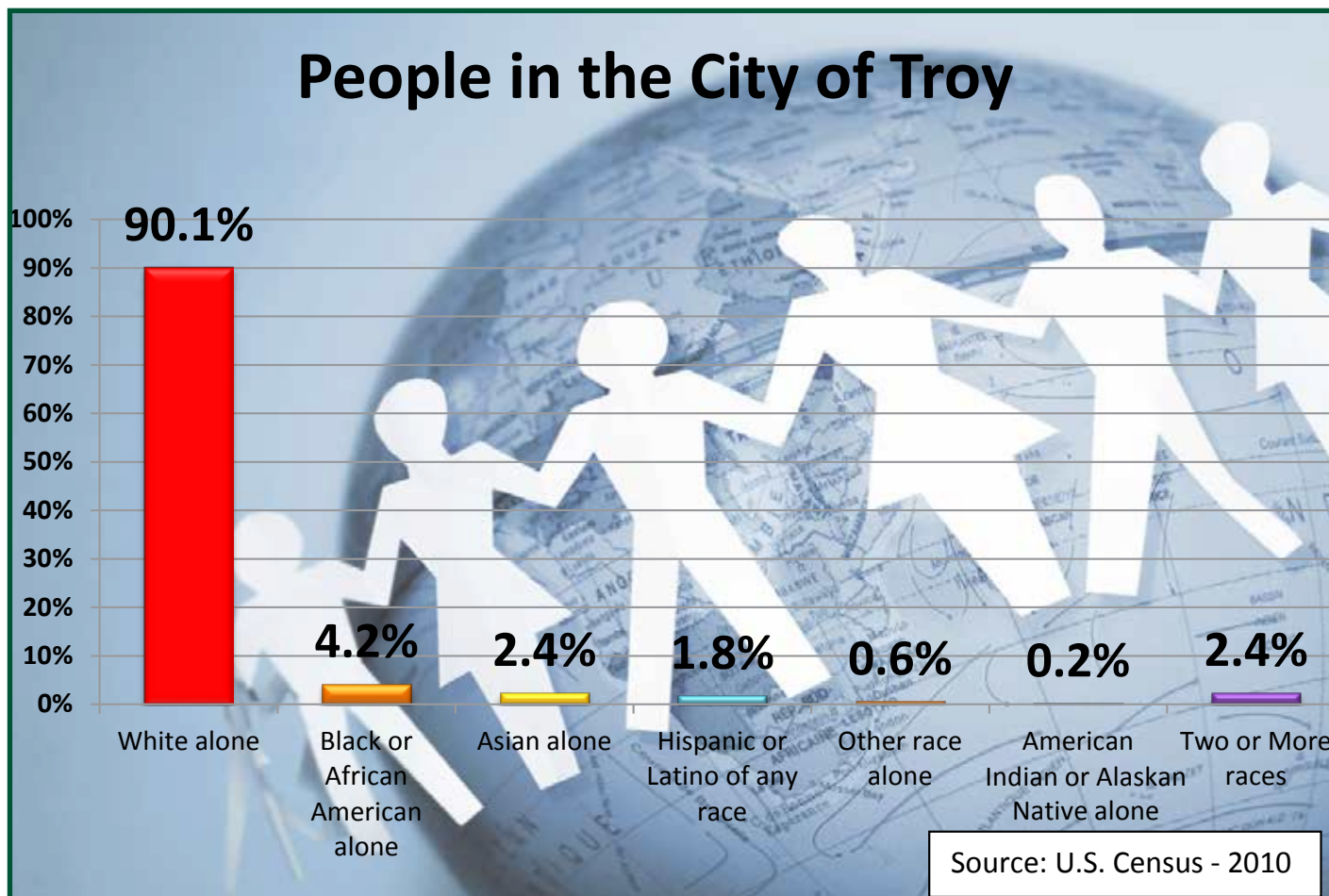
Troy City Hall.

Demographics

According to the 2010 Census, the population of the city of Troy is 25,058 people with a median age of 36.9. The racial make-up is predominantly white with 90.1 of the population, followed by 4.2 percent African American, 2.4 percent Asian, .6 percent identifying themselves as “some other race”, .2 percent American Indian or Alaskan Native, 1 individual self-identified as Native Hawaiian or Other Pacific Islander, and 2.4 percent that are of two or more races. About 1.8 percent also identified themselves as Hispanic or Latino of any race.

There are 11,166 total housing units in Troy, 92.7 percent of which are occupied. Of the occupied units, 59.2 percent are owner-occupied. There are 10,353 total households, 63.7 percent of which are family households. About 30.1 percent of all households have children under the age of 18 years.

Source: U.S. Census



* Note: 1 individual in Troy self-identified as Native Hawaiian or Other Pacific Islander.

According to the 2009-2013 American Community Survey Estimate, about 88.5 percent have a high school education or equivalent and about 22.5 percent have attained a bachelor's degree or higher. The median household income was estimated as \$48,570. According to the 2009-2013 American Community Survey, approximately 16.2 percent of the population of Troy lives below the poverty level.

The language spoken in Troy is predominantly English with 95.4 percent of the population speaking only English. Approximately 4.6 percent of the population speak a language other than English, of those, 2.3 percent speak Asian and Pacific Island languages, 1.2 percent speak Spanish or Spanish Creole, .7 percent speak "other Indo-European" languages, and .3 percent speak "other" languages.

Source: U.S. Census

East Troy neighborhood

The East Troy neighborhood is primarily residential throughout, with a concentration of industrial/commercial operations, especially along Main Street. Three schools are located in the neighborhood: the St. Patrick Elementary School, the Van Cleve 6th Grade Building and the Forest Elementary School.



The First Presbyterian Church is located in the East Troy neighborhood.



St. Patrick School is located in the East Troy neighborhood.



K's, located in the East Troy neighborhood is a popular eating spot.

Miami County

Miami County consists of 407 square miles. It was formed in 1807, is located in western Ohio just north of Dayton and is predominately rural.

Governmental structure

The Miami County government consists of a three-member Board of County Commissioners. The commissioners are elected and serve four-year terms. They meet weekly at regularly-scheduled meetings to discuss county business. The commissioners hire a county clerk/administrator who implements the board's policies. The commissioners are primarily responsible for managing county finances, facilities and personnel.

Source: <http://www.co.miami.oh.us/>



Miami County Courthouse in Troy.

Demographics

According to the 2010 Census, the population of Miami County is 102,506 people with a median age of 40.6. The racial make-up is predominantly white with 94.4 of the population, followed by 2 percent African American, 1.2 percent Asian, .5 percent identifying themselves as “some other race”, .2 percent American Indian or Alaskan Native, 15 people identifying themselves as Native Hawaiian or Other Pacific Islander, and 1.8 percent that are of two or more races. About 1.3 percent also identified themselves as Hispanic or Latino of any race.

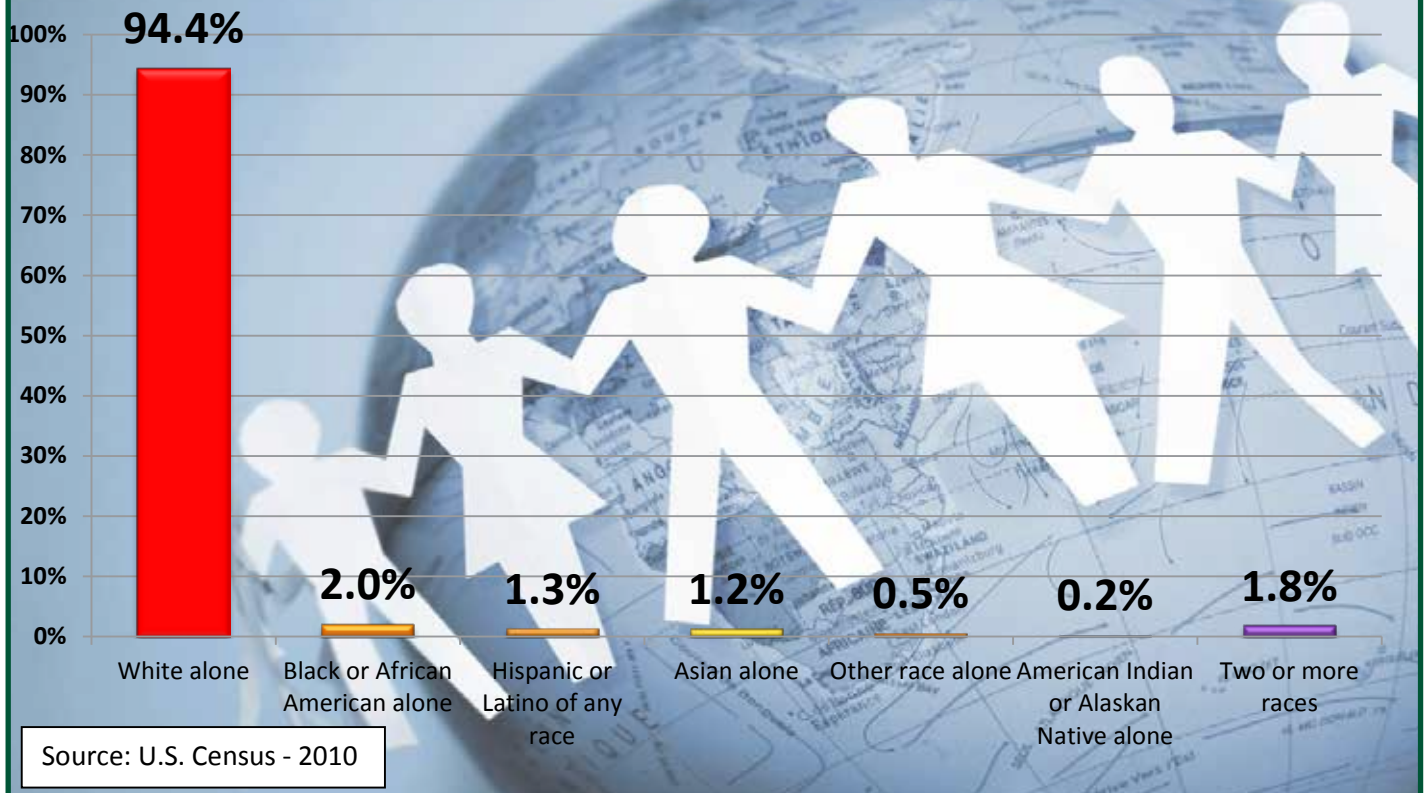
There are 44,256 total housing units in Miami County, 92.5 percent of which are occupied. Of the occupied units, 71.4 percent are owner-occupied. There are 40,917 total households, 70 percent of which are family households. About 29.1 percent of all households have children under the age of 18 years.

According to the 2009-2013 American Community Survey Estimate, about 88.4 percent have a high school education or equivalent and about 19.7 percent have attained a bachelor's degree or higher. The median household income was estimated as \$52,040. According to the 2009-2013 American Community Survey, approximately 13 percent of the population of Miami County lives below the poverty level.

The language spoken in Miami County is predominantly English with 97.3 percent of the population speaking only English. Approximately 2.7 percent of the population speak a language other than English, of those, 1 percent speak Asian and Pacific Island languages, .9 percent speak Spanish or Spanish Creole, .7 percent speak “other Indo-European” languages, and .1 percent speak “other” languages.

Source: U.S. Census

People of Miami County



* Note: 15 individuals in Miami County identified themselves as Native Hawaiian or Other Pacific Islander.

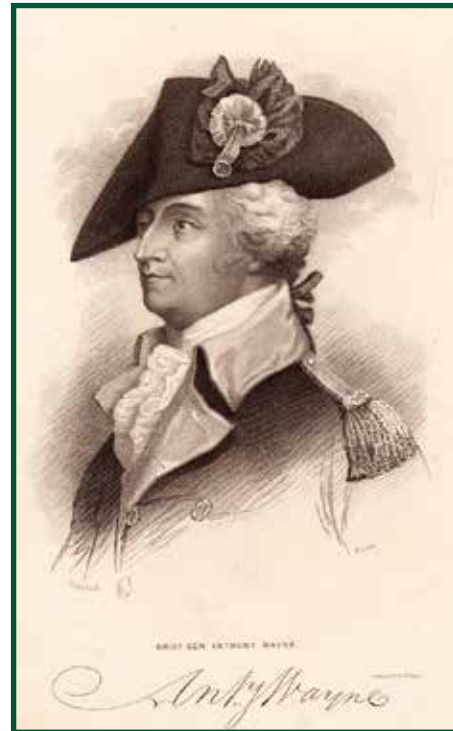
Miami County history

Miami County is named in honor of a Native American tribe, called the Miami, who moved into the area in the 1700s. At one time, the Miami was the most powerful tribe in Ohio. At first, the Miami were allies of the French, but later fought with the British during the American Revolution with the intent to stop the white settlers moving into Ohio. The Miami continued that fight after the war, but were ultimately defeated by General Anthony Wayne in 1794 during the Battle of the Fallen Timbers. As a result, the Miami were eventually forced to give up their land and moved out of Ohio.

Source: http://www.ohiohistorycentral.org/w/Miami_Indians

As more settlers moved in, fourteen townships were organized in the county. Growth in the county was fueled by its access first to the Miami River, followed by Miami and Erie Canal, the railroad and finally modern interstates. Today Miami County employs many in the healthcare, aerospace, food, and automobile industries all of whom take advantage of the excellent proximity to national transportation routes.

Source: http://www.ohiohistorycentral.org/w/Miami_County



Portrait of General Anthony Wayne.

Source: University of Chicago. Library. Butler-Gunsaulus. Collection. Portraits, Special Collections Research Center, University of Chicago Library.



Built in 1804, this log home located just outside Troy is the oldest structure in its original location in Miami County. It was home to Benjamin Iddings a cousin of General Anthony Wayne.



Barn quilts like the one in this photo can be found all over Miami County.

“Miami County embodies the past and present, tight-knit families, trusted business partners, welcomed guests and an extended community – side-by-side – ready to create a better tomorrow.

That’s Miami County, Ohio.... not just good. Home. Grown. Great.”

- Miami County Visitors and Convention Bureau

THE SITE

Description and history of activities at the site.

East Troy Contaminated Aquifer Site

Site Location Map



The East Troy Contaminated Aquifer site encompasses a relatively old residential, industrial, and commercial portion of the city of Troy. Most of the residences within the 20-block area are more than 60 years old.

Site Investigation

In 2015, U.S. EPA completed its investigation into the contamination at the site, called a remedial investigation, or RI. During the RI, U.S. EPA sampled area **groundwater**, soil, **soil gas**, indoor air, surface water and sediment. The following is a summary of the investigation.

The East Troy Contaminated Aquifer site is located in Troy, Miami County, Ohio, and includes two general areas of groundwater contamination, called **plumes**, lying west of the Miami River that are believed to originate from separate, multiple sources. One area of contamination, referred to as the “Residential Area Plume,” originates in the vicinity of East Main and Walnut Streets (*see map below*). It extends southeastward beneath a primarily residential area. This plume primarily contains tetrachloroethene, or PCE, with trichloroethene, or TCE, and **cis 1,2 dichloroethene**, or **cis-DCE**, occasionally detected at lower concentrations. A “sub” area of PCE contamination in groundwater that is currently

separate from the main portion of the Residential Area PCE Plume, is located along South Union Street between East Main and East Franklin Streets and may have originated from a different source than the main part of the Residential Area Plume. However, due to the similarity in contaminants and due to its location, this sub area is still considered to be part of the Residential Area Plume.

The second area of contamination, referred to as the “East Water Street Plume,” extends from the vicinity of the former Hobart Cabinet Co. property on East Water Street and southeastward beneath a mixed industrial, residential and institutional area. PCE, TCE, and *cis*-DCE are present in this plume. PCE and TCE have also been detected in the soil at the former Hobart facility. Next to the Hobart facility is a second industrial facility, formerly Brown Bridge Industries (now owned and operated by Spinnaker Coatings LLC where volatile organic compounds, or VOCs, including the same VOCs present on the Hobart property, have been detected in soil and groundwater.

Site Features Map



Groundwater contamination has also been detected on the east side of the river in the city's East Wellfield. The municipal water supply wells in the city of Troy's East Wellfield are monitored monthly for VOCs. Over the years, *cis*-DCE has been detected at four East Wellfield wells. It is important to note that VOC concentrations in wells within the Troy East Wellfield have been well below levels considered a health concern in drinking water.

Next step in the investigation

U.S. EPA's next step will be to develop a **Focused Feasibility Study** report. The report will evaluate potential alternatives to address the on-going sources of contamination into the groundwater. The Focused Feasibility Study, or FFS, is expected to be finalized in the summer of 2017. EPA expects to issue a **proposed plan** in 2017 inviting the public to comment on the proposed remedial alternative. After the public comment period, an Interim Action - **Record of Decision** is expected to be issued in 2018. A Record of Decision, or **ROD**, documents EPA's selected cleanup method to address the contamination. Once the sources of contamination are addressed, EPA will tackle the site-wide groundwater in a Final ROD for the entire site.

Vapor intrusion investigation

On June 30, 2006, the Ohio EPA requested U.S. EPA assistance in conducting a time-critical removal action at the East Troy Contaminated Aquifer site. During time-critical removals an evaluation of the site must be performed and removal actions must be initiated within six months.

Ohio EPA noted that residences and other occupied structures above and next to the groundwater contamination, referred to as plumes, are at risk for exposure to VOCs through vapor intrusion from soil gas to indoor air. Ohio EPA requested U.S. EPA to conduct sampling to determine the extent of vapor intrusion contamination and to take action to lower levels of VOCs in indoor air that exceed screening levels established by the Agency for Toxic Substances and Disease Registry and Ohio Department of Health. From July 2006 through April 2007, U.S. EPA collected sub-slab and indoor air samples from a total of 85 locations, which included 78 residences, 2 churches, 4 schools and the Troy Police Station. Sampling confirmed VOCs above health standards in indoor air at residential and commercial properties due to vapor intrusion.

Explanation of evaluation criteria

U.S. EPA compares each cleanup option or alternative with these nine criteria established by federal law:

- 1. Overall protection of human health and the environment** examines whether an option protects living things. This standard can be met by reducing or removing pollution or by reducing exposure to it.
- 2. Compliance with applicable or relevant and appropriate requirements, or ARARs**, ensures options comply with federal, state and local laws.
- 3. Long-term effectiveness and permanence** evaluates how well an option will work over the long-term, including how safely remaining contamination can be managed.
- 4. Reduction of toxicity, mobility or volume through treatment** determines how well the option reduces the toxicity, movement and amount of pollution.

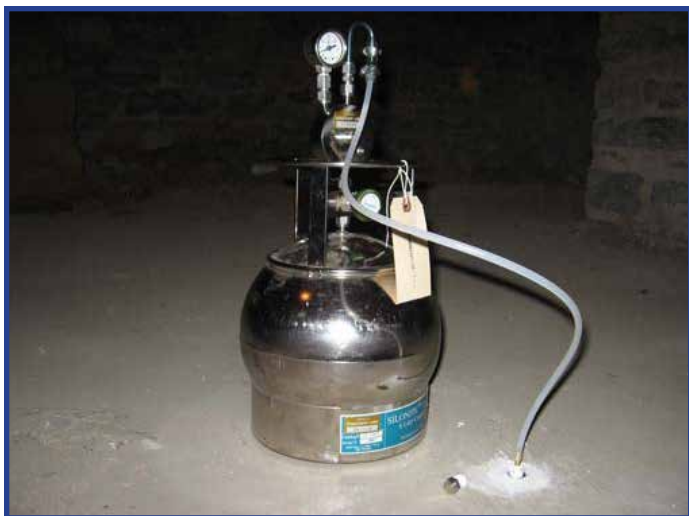
5. Short-term effectiveness compares how quickly an option can help the situation and how much risk exists while the option is under construction.

6. Implementability evaluates how feasible the option is and whether materials and services are available in the area.

7. Cost includes not only buildings, equipment, materials and labor but also the cost of maintaining the option for the life of the cleanup.

8. State acceptance determines whether the state environmental agency (in this case Ohio EPA) accepts an option. U.S. EPA evaluates this criterion after receiving public comments.

9. Community acceptance considers the opinions of nearby residents and other community members about the proposed cleanup plan. U.S. EPA evaluates this standard after a public hearing and comment period.



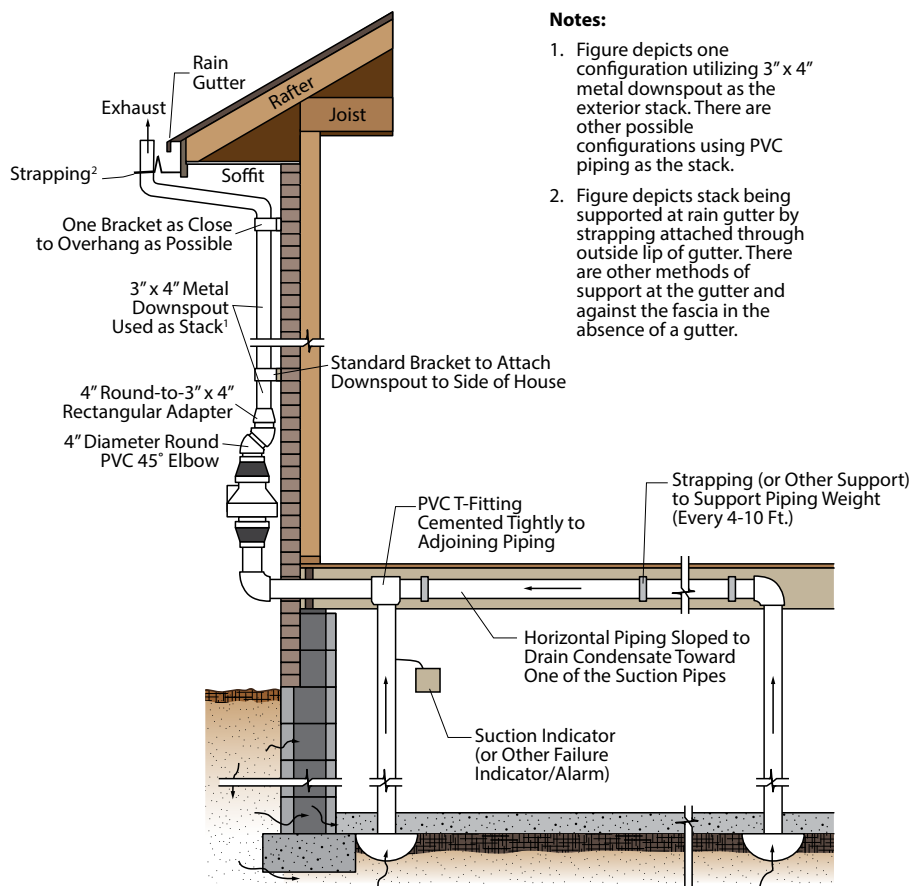
In this example of "sub-slab" sampling, tubing is run from underneath a basement floor to a "Summa" canister to test for hazardous vapors trapped in the soil.

From June 2007 through April 2008, U.S. EPA installed 17 systems that help remove vapors from a building called vapor abatement, or removal, systems. The systems were installed in 16 homes and at St. Patrick Elementary School. U.S. EPA followed up the installation of the systems with system monitoring to

be sure the systems were working correctly. Additional locations were tested between 2012 and 2013 as part of the RI. U.S. EPA will address future concerns regarding vapor intrusion through the FS and the ROD.



A vapor removal system on a home.



Notes:

1. Figure depicts one configuration utilizing 3" x 4" metal downspout as the exterior stack. There are other possible configurations using PVC piping as the stack.
2. Figure depicts stack being supported at rain gutter by strapping attached through outside lip of gutter. There are other methods of support at the gutter and against the fascia in the absence of a gutter.

A diagram of a vapor removal system.

COMMUNITY CONCERNS AND QUESTIONS

Summarizes what community members are concerned about, the questions they asked and what they told U.S. EPA

What We Heard

The concerns and issues from community members about the sites.

We learned about concerns, questions and informational needs related to the East Troy Contaminated Aquifer Superfund site, by conducting interviews with 36 residents, local officials and other interested community members in December 2015. The community interviews for the East Troy Contaminated Aquifer site were conducted in conjunction with the interviews for the West Troy contaminated Aquifer site to reduce the amount of time the public and local officials spent during the interview process. Before conducting the interviews, U.S. EPA mailed postcards to residents

near the East and West Troy Contaminated Aquifer sites announcing the interviews and asking them to schedule an appointment to talk with us about their concerns. Other interviews were scheduled by direct phone calls. General concerns for both of these sites and specific comments regarding the East Contaminated Aquifer site are on Pages 22-26.

General Comments and Concerns

The comments below are general comments we heard pertaining to both sites.

Note to readers: *This section is intended to faithfully record and reflect the issues and concerns expressed to U.S. EPA by residents, officials and others interviewed during the community interviews. By necessity, this is a collection and summary of thoughts and observations and, in some cases, opinions. Please be cautioned that the statements contained in this section may or may not be factual and that the opinions and concerns expressed may or may not be valid.*

Water concerns

One of the biggest issues raised by people interviewed was regarding water as a resource for the community. As one person said, “Water is one of our most valuable assets – the aquifer, river and downtown fountain, so we want to protect it.” Another said, “We have an amazing water source that we want to keep. We are very protective of our aquifer.” People said they don’t want contamination, or perception of contamination, of their water. People also said that one of the signature things about Troy is the river. They explained that they want to build around the river. Several interviewees stated that the city is trying to bring the people to the river for culture, recreation and education.



Dennis Propes, Miami County Public Health Commissioner, asks questions of U.S. EPA regarding both sites.

Health - related to drinking water

Several people stated that they were concerned about the potential for the contamination in the aquifer to contaminate the drinking water, and the potential health effects from drinking contaminated water. Two people said they were worried about the health of their children and grandchildren if the drinking water became contaminated. Two interviewees said that they have a drinking water well – they said they were “grandfathered in.” They expressed concern about whether their water was safe. One person said he was concerned about contamination of the city wells. Another person told U.S. EPA people do have wells that they use for watering gardens, etc. He said the well water may not be used for drinking, but could still be a concern. Finally, one person said he thought that people in the community were less concerned about the groundwater contamination because they drink city water, which is monitored for them.

Development

Many of the people interviewed expressed concern about how the investigation, the cleanup of, and any stigma attached to the sites could potentially affect development in Troy.

People talked about plans along the river and in the downtown area. Two people said they would like to know what challenges people could face if buying property in Troy so that they would know how to proceed with development plans. Two other people questioned if they were to tear down a building in the affected East Troy, would they be allowed to rebuild in the same spot. A couple of people also expressed concern about how any stigma attached to having a Superfund site in their town could deter development. One person said, “I have never seen a National Priorities List site bring an economic boon to development.”

Communication

Several people interviewed said they believed that the communication U.S. EPA has had with the community regarding the East Troy Contaminated Aquifer site has been good. One person said he thought U.S. EPA has done a good job alleviating people’s fears. He said U.S. EPA had also done a good job of explaining activities at the East Troy site. He also said that when people who attended the public meetings had questions regarding whether they could be exposed to contamination while showering, U.S. EPA explained the situation well to them. He said, “A lot of positive groundwork was laid by U.S. EPA.” However, several people said they needed help



U.S. EPA meets with city and county officials.

interpreting sampling results. They said they “need more than the numbers – they need to know what they mean.”

Another person interviewed said he felt U.S. EPA did a good job of communicating initially, but once the vapor removal systems were put in and the follow-up testing was done, he hadn’t heard anything. He went on to explain that, since follow-up testing showed the system installed in my home was working effectively, he wasn’t too concerned. But, he hadn’t heard anything lately. He said he assumed U.S. EPA was working on it and would let him know, but again, he hadn’t heard anything, and would have liked to.

A couple of people said that they were concerned that people will jump to conclusions if they don’t understand. They said they did not want to create public panic for no reason. One said she trusted the city was on top of it.

Because the investigation of the West Troy site is just beginning and U.S. EPA has not released any information other than the press releases regarding the proposal and placement of the site on the

National Priorities List, people did not express any observations about U.S. EPA’s communication with the community about the West Troy site. None-the-less, people interviewed did not express concerns about the little information currently available regarding the West Troy site and indicated they trusted that, once any new information was available, U.S. EPA would communicate with them.

Paying for cleanup/responsible parties

Several people interviewed questioned who was going to pay for the cleanup. One person questioned whether it makes sense that the Superfund law requires companies to pay to clean up a site [if they were responsible for the contamination] when what they did was legal at the time. Another person questioned who would pay for a cleanup if the responsible party was no longer around.

Awareness about the sites

When U.S. EPA asked interviewees if they were aware of the East and West Troy Contaminated Aquifer sites, most were aware of the East Troy site. Many were aware of both sites, but less so with West Troy. A few were not aware of either site. One person that lived in the East Troy neighborhood said that a lot of his neighbors said they were not aware of the contamination. One person interviewed from the East Troy neighborhood said that she believed many people in the neighborhood know about the contamination, but are turning a blind eye to it. A few people interviewed said that their understanding of the West Troy site was that it was an area where fill had been added to an area along the river where they understood dumping had previously taken place.

Meetings

When asked about whether they would attend a public meeting about the sites, the majority said they would, several people said they would not and others said they might. Of those that said they would not go, one person stated that it was because she counts on U.S. EPA to watch over her and if she didn’t think the Agency was, then it would be a big deal and she would be involved.



U.S. EPA Community Involvement Coordinator, Adrian Palomeque, left, explains the two sites to a local resident.

When asked about the meetings that had already been held, several people said they thought the meetings had been well attended. Although, one person said that he was surprised more people were not at the meetings. He said he thought they should have been packed. Another person said that U.S. EPA did not provide much information at the meeting she attended at Van Cleve School. Still another said she was not aware of any of the meetings.

One person said that face to face meetings were important. He said that, unless you meet face to face, people will think you are hiding something. He said transparency is key.

U.S. EPA websites

When U.S. EPA asked people if they had visited U.S. EPA's website(s), a few of the people interviewed said that they had. Of those, one person said, "It did not have any real information" and that the information about the contaminants was too technical. Some city officials said that they had directed people to the websites.

Information repository

Most people U.S. EPA interviewed were not aware of the existence of U.S. EPA's information repository at the library. Most said it was good to know the information was available although they would not likely go to look at it. A few said they might visit the repository.

East Troy Comments and Concerns

Comments U.S. EPA heard specific to the East Troy Contaminated Aquifer site.

Health - related to vapor intrusion

Several people interviewed expressed concern about the potential health effects associated with vapor intrusion contamination from the East Troy site. A few people talked about young kids at one house in the East Troy neighborhood who were constantly sick, explaining that the family eventually moved out. Two of the people that talked about this family



Above top and bottom: Two active couples in the Troy community express their concerns and ask questions of Adrian Palomeque of U.S. EPA, left.

said they thought the house had been torn down. One man that lived in East Troy said he remembered one person at one of the earlier meetings who was convinced that her health (nerve problems) were caused by the site. This man said he was worried about his wife and kids. A few people said they were worried about the safety of kids in the school buildings in the East Troy neighborhood. Another said "I assume the schools are safe. Are they?"

Vapor removal systems

Three people interviewed said that they had vapor removal systems installed in their home(s). One said that the testing after the system was installed showed a dramatic difference – that the system was very effective. One said he doesn't notice any difference, but assumed it was working well and assumed that U.S. EPA did follow-up testing, but does not remember the results. Another said she was happy to

have the system and expressed frustration that more people in the neighborhood did not have their homes tested.

Property sales

A couple of people expressed concern about selling property in the East Troy neighborhood. One individual said he will eventually want to sell his home and doesn't want the contamination to make it difficult to sell. He said if something is not done, that will be a real concern. Another person said that many people in the East Troy neighborhood do not want to have their homes tested because they do not want to have to disclose the information when they decide to sell their home. She said that people have sold their homes to people who have moved into the neighborhood that have no idea about the problem.

Gardening

Two residents of the East Troy neighborhood said they were worried about the potential effect of the contamination on the vegetables they grow in their garden. They said they would like to know if it is safe to grow and eat those vegetables.

Cleanup plan

One person interviewed expressed concern about what the cleanup plan would entail. He wondered if the plan would include trying to get the contamination out of the ground and said he was concerned about how that would affect the residential neighborhood in East Troy.



Deb Oexmann, left, Director of the Brukner Nature Center talks with U.S. EPA Community Involvement Coordinator Adrian Palomeque.

Yard problem

One couple who lived in the East Troy neighborhood told U.S. EPA that there was a brown patch in their yard about 50'x2' that would not go away. They said they wondered if it was caused by the contamination.



Adrian Palomeque, left, listens to what a local resident has to say about the sites.



Librarian of the Local History Branch of the Troy-Miami Public Library, Patrick Kennedy, right, discusses site files housed there.

Means of communication recommended

- Troy Daily News. One person questioned why the community interviews were not published in the newspaper.
- Dayton Daily News. However, one person said if it is in the Dayton news, it would really scare people.
- WHIO TV Channel 7 (Dayton) One person questioned why meetings and the community interviews were not announced on TV.
- WDTN TV Channel 2 (Dayton)
- Mailings
- Post on mymiamicounty.com
- 107.1 FM radio – the station has news reports
- Master Gardeners
- Troy Tribune
- Nancy Bowman is a freelance reporter in the area that is trusted – perhaps engage her.
- Bravotroyohio.com
- Troyohiousa.com
- Reach out to kids to reach their parents
- Scout troops
- Mayor's office newsletter (quarterly)
- Booth at Strawberry Festival
- Go door-to-door
- Facebook
- Science fairs at schools
- Eagles, Moose, VFW, American Legion, etc. Lodges



U.S. EPA Community Involvement Coordinator Adrian Palomeque, left, talks with Lincoln Community Center Director Shane Carter about how to engage the community.



Lincoln Community Center.

"We are glad you are doing something about this – we all want it fixed."

- Local resident



The square in downtown Troy.

When asked what was special to them about their community, people said:

- We have a very strong, civic minded community
- Conservative
- It is a clean, beautiful small town – even low income streets are well kept
- Troy has good recreation facilities, arts and culture
- The downtown is alive
- Troy is a community that looks pretty all year long.
- It is safe
- Troy is in a great location with great access to the rest of the country being located near two main highways.
- Troy is an exceedingly philanthropic community.
- We have good schools
- The Strawberry Festival

- Troy was named:
 - One of Ohio's Best Hometowns for 2009 by Ohio Magazine.
 - 7th Happiest City in Ohio by Credit Donkey (a credit card comparison and financial education website)
 - A quarter finalist in America's Best Communities Competition among 50 other communities across the country.

Some memories people talked about:

- Growing up here was small town USA. Many farms surround the town and coming to Troy was going to town.
- Going to Hobart Arena
- The lighting of the Christmas tree

Note to readers:

- a) Indicates answers pertain to the **East Troy Contaminated Aquifer** site
- b) Indicates answers apply to **both** the East and West Troy Contaminated Aquifer sites.

Information requested

➤ ***A good map of where the site is***

- a) Maps for the East Troy Contaminated Aquifer site can be found on Pages 18 and 19 of this CIP. Additional maps and information can be found at U.S. EPA's site webpage, www.epa.gov/superfund/east-troy-aquifer.

➤ ***The direction of the movement of the contaminants***

- a) The flow of contaminants for the East Troy site is generally southeast and parallel to the Great Miami River. There are some localized and seasonal variations particularly in the area immediately adjacent to the river and also in the area near the East Wellfield. Additional information can be found in the Groundwater Elevations and Flow section (3.4.2.2) of the Final Remedial Investigation Report, available at the U.S. EPA's site webpage.

➤ ***A map of sampling locations with test results***

- a) Sampling locations maps for the East Troy site can be found in the Final Remedial Investigation Report on Figures 2-1, 2-2 and 2-3. Additional maps with sampling locations and test results for soil are on figures 4-1 through 4-4; for groundwater on figures 4-5 through 4-15; and for vapor intrusion on figures 4-16 and 4-17. Detailed information regarding the investigation activities and the extent of the contamination is located on Sections 2 and 4 respectively of the same report.

➤ ***The proposed cleanup plan once it is available***

- a) After the Focused Feasibility Study, or FFS, is complete for the site, cleanup alternatives

will be published along with a proposed plan. Community members will be able to view the proposed plan for the cleanup and provide comments. The plan for each site will be available in the administrative record and the information repository.

➤ ***An explanation of what the terms Superfund and National Priorities List mean***

- b) Definitions of Superfund and National Priorities List can be found in this CIP's Glossary section, located in Appendix A. Additional information regarding the Superfund process can be found in Appendix E of this CIP.



Troy Development Council members Steve Justice, right, and J.C. Wallace, middle, express their concerns about the sites.

Questions interviewees asked U.S. EPA

➤ *How was the site discovered?*

- a) The East Troy site was discovered in the beginning of 1988 when low concentrations of chlorinated volatile organic compounds, or VOCs, were found in raw water samples collected from several production wells in Troy's East Wellfield. The U.S. EPA proposed the East Troy for inclusion on the National Priorities List in 2007.

➤ *Where is the contamination?*

- a) In the East Troy site area there are two primary groundwater contaminant plumes, the Residential Area Plume and the East Water Street Plume. The East Troy site includes an area west of the Great Miami River that extends from approximately South Walnut Street on the northwest to Floral Avenue on the southeast. This area is generally bounded by Canal and Scott streets on the southwest, and the river on the northeast.

➤ *What is the contamination?*

- a) Tetrachloroethene, or PCE and trichloroethene, or TCE have been detected at concentrations exceeding U.S. EPA **Safe Drinking Water Act maximum contaminant levels, or MCLs**. Other VOCs have been detected at levels below MCLs including *cis*-1,2-dichloroethene, or *cis*-DCE, **chloroform**, bromodichloromethane, and dibromochloromethane.

➤ *What are the health risks?*

- a) Information on health risks associated with the site can be found in Section 6.0 of the Final Remedial Investigation and on the Public Health Assessment. The assessment is available at www.epa.gov/superfund/east-troy-aquifer.

➤ *Where did it come from?*

- a) Numerous businesses and industries operated in the site area during the 20th century. Several of these have been identified as potential sources of the contamination at the East Troy

site. One former dry cleaner has been identified in the area where the Residential Area Plume originates in the vicinity of the intersection of East Main and South Walnut streets. The second primary area of contamination, referred to as the East Water Street Plume, starts from the vicinity of the rear of the former Hobart Brothers Cabinet Company property at 301 E. Water St., and extends southeastward beneath and parallel to East Water Street.

➤ *Did it come from a dry cleaners business?*

- a) A former One-Hour Martinizing Dry Cleaner that was located near the intersection of East Main and South Walnut streets has been identified as source for the Residential Area Plume.

➤ *Will this ever go away?*

- b) U.S. EPA works with the community through an array of tools, partnerships, and activities to help return these sites to productive uses. The level of site cleanup will be provided in the proposed plan and it will be available for public comment. Depending on the remedy selected for the site, regular checkups of the site after the cleanup is complete may be necessary to ensure the cleanup continues to protect people and the environment.

➤ *Should I be doing something to keep myself safe?*

- b) The best way to be safe is to stay informed about the site, get involved and reach out to the appropriate local, state and federal officials as needed. Information for each site is available at the U.S. EPA website and is periodically updated as new significant public information becomes available. At different stages of the cleanup process there are opportunities for you to ask questions and provide comments. We welcome questions regarding public health and input about how a particular site should be cleaned up. U.S. EPA sends out notices when meetings and public comment periods are set up. But you don't need to wait for those notices – you can contact us anytime. We want to hear from you.

- ***Should I be drinking bottled water?***
 - b) It is not necessary, Troy's water treatment plant monitors and tests the drinking water for compliance with federal and state regulations.
- ***Are homes or buildings being tested for vapor intrusion?***
 - a) At the East Troy site, vapor intrusion testing has been completed. It took place during the remedial investigation, or RI, which ended in 2015.
- ***How many people got systems?***
 - a) Eighteen properties have systems at the East Troy site. Seventeen homes and one school.
- ***Are you monitoring both sides of the river?***
 - a) At East Troy both sides were monitored during the RI but not at this stage of the process.
- ***Can the plume be contained to its present location or is it moving?***
 - a) At East Troy, groundwater is moving very slowly.
- ***Who is going to pay for the cleanup?***
 - b) Both sites are currently federally financed but U.S. EPA is searching for **potentially responsible parties** that may be able to pay for cleanup-related costs.
- ***Is soil contamination a problem in addition to groundwater contamination?***
 - a) At East Troy, VOCs have been identified in groundwater, soil, or indoor air space of residential, public and commercial properties.
- ***What are the next steps?***
 - a) Issue a record of decision, or ROD, in 2018 and negotiate with potentially responsible parties to pay for the cleanup.

** This CIP is a tool to provide information to the public and promote community engagement for the East Troy Contaminated Aquifer site. If you are seeking additional information regarding the West Troy Contaminated Aquifer site please review the CIP for the site at <http://www.epa.gov/superfund/west-troy-aquifer>.*

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Appendix A

Glossary – Initials -Acronyms

Administrative Record. The body of documents that forms the basis for the selection of a particular response at a site. For example, the Administrative Record for remedy selection includes all documents that were considered or relied upon to select the remedy through the record of decision.

Aquifer. An aquifer is a geological formation that is capable of yielding a significant amount of water to a drinking water well or spring. When rain falls to the ground, the water does not stop moving, some seeps underground, into pores between sand, clay and rock formations called aquifers. Many communities obtain their drinking water from aquifers through both public water systems and through private wells.

Bromodichloromethane. Most bromodichloromethane is formed as a by-product when chlorine is added to water-supply systems. Bromodichloromethane is not known to cause adverse health effects in people, but animal studies show that high concentrations can damage the liver and kidneys and affect the brain. More information can be found on the following website: www.atsdr.cdc.gov/toxfaqs/tfacts129.pdf.

CAG. See Community Advisory Group.

CERCLA. See Comprehensive Environmental Response, Compensation and Liability Act.

CIC. See Community Involvement Coordinator.

CIP. See Community Involvement Plan.

cis-DCE. See *cis* 1,2 Dichloroethene.

***cis* 1,2 Dichloroethene.** 1,2-Dichloroethene, also called 1,2-dichloroethylene, is a highly flammable, colorless liquid with a sharp, harsh odor. It is used to produce solvents and in chemical mixtures. 1,2-Dichloroethene evaporates rapidly into air. 1,2-Dichloroethene can travel through soil or dissolve in water in the soil. It is possible that it can contaminate groundwater. You can smell very small amounts of 1,2-dichloroethene in air. Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired; breathing very high levels can kill you. More information can be found on the following website: www.atsdr.cdc.gov/toxfaqs/tfacts87.pdf.

Chloroform. Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. In the past, chloroform was used as an inhaled anesthetic during surgery, but it isn't used that way today. Today, chloroform is used to make other chemicals and can also be formed in small amounts when chlorine is added to water. Exposure to chloroform can occur when breathing contaminated air or when drinking or touching the substance or water containing it. Breathing chloroform can cause dizziness, fatigue, and headaches. Breathing chloroform or ingesting chloroform over long periods of time may damage your liver and kidneys. It can cause sores if large amounts touch your skin. More information can be found on the following website: www.atsdr.cdc.gov/toxfaqs/tfacts6.pdf.

Cleanup. Actions taken to deal with a release or threat of release of a **hazardous substance** that could affect humans and/or the environment. The term “cleanup” is sometimes used interchangeably with the terms “remedial action,” “remediation,” “removal action,” “response action,” or “corrective action.”

Community. An interacting population of various types of individuals, or species, in a common location; a neighborhood or specific area where people live.

Community Advisory Group. A committee, task force, or board made up of citizens affected by a **hazardous waste** site. CAGs provide a public forum for community members to present and discuss their needs and concerns about the decision-making process at sites affecting them.

Community Engagement. The process of involving communities in all phases of the cleanup process. Communities are asked to provide input on how the cleanup will be conducted and how it may affect community plans and goals. See also Community Involvement.

Community Involvement. The term used by U.S. EPA to identify its process for engaging in dialogue and collaboration with communities affected by Superfund sites. U.S. EPA’s community involvement approach is founded in the belief that people have a right to know what the Agency is doing in their community and to have a say in it. Its purpose is to give people the opportunity to become involved in the Agency’s activities and to help shape the decisions that are made.

Community Involvement Coordinator. The U.S. EPA official whose lead responsibility is to involve and inform the public about the Superfund process and response actions in accordance with the interactive community involvement requirements set forth in the National Oil and Hazardous Substances Pollution Contingency Plan.

Community Involvement Plan. A plan that outlines specific community involvement activities that occur during the investigation and cleanup at the site. The CIP outlines how U.S. EPA will keep the public informed of work at the site and the ways in which residents can review and comment on decisions that may affect the final actions at the site. The document is available in the site’s information repository maintained by U.S. EPA. The CIP may be modified as necessary to respond to changes in community concerns, information needs and activities.

Comprehensive Environmental Response, Compensation, and Liability Act. A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. Commonly known as Superfund, CERCLA is intended to protect people’s health and the environment by investigating and cleaning up abandoned or uncontrolled hazardous waste sites. Under the program, U.S. EPA can either:

- Pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to do the work; or
- Take legal action to force parties responsible for site contamination to clean up the site or pay back the federal government for the cost of the cleanup.

Contaminant(s). Any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.

Contamination. Introduction into water, air and soil of microorganisms, chemicals, toxic substances, wastes or wastewater in a concentration that makes the medium unfit for its next intended use. Also applies to surfaces of objects, buildings and various household use products.

Dibromochloromethane. Dibromochloromethane is formed as by-products when chlorine is added to water supply systems. High levels of dibromochloromethane can damage the liver and kidneys and affect the brain. More information can be found on the following website: www.atsdr.cdc.gov/toxfaqs/tfacts130.pdf.

Feasibility Study. See Remedial Investigation/ Feasibility Study.

Groundwater. Underground supplies of drinking water.

Hazardous Substance(s). Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive or chemically reactive. Any substance designated by U.S. EPA to be reported if a designated quantity of the substance is spilled in the waters of the United States or is otherwise released into the environment.

Hazardous Waste. Byproducts that can pose a substantial or potential hazard to human health or the environment when improperly managed. Hazardous wastes usually possess at least one of four

characteristics (ignitability, corrosivity, reactivity or toxicity) or appear on special U.S. EPA lists.

Information Repository. A file containing current information, technical reports and reference documents regarding a site. The information repository usually is located in a public building convenient for local residents such as a public school, town hall or library.

Maximum Contaminant Levels. The maximum permissible level of a contaminant in water delivered to any user of a public system. MCLs are enforceable standards for drinking water.

MCLs. See Maximum Contaminant Levels.

National Priorities List. U.S. EPA's list of serious uncontrolled or abandoned hazardous waste sites identified for possible long-term cleanup under Superfund. The list is based primarily on the score a site receives from the Hazard Ranking System. U.S. EPA is required to update the National Priorities List at least once a year.

NPL. See National Priorities List.

Parts Per Billion. A unit of measurement used in measuring the concentration of contaminants in air, soil or water. One part per billion could be compared to one second in 32 years.

PCE. See tetrachloroethene.

Plume(s). A plume is a visible or measurable discharge of a contaminant from a given point of origin. It can be visible or thermal in water, or visible in the air as, for example, a plume of smoke.

Potentially Responsible Party(ies). Any individual or company (including owners, operators, transporters or generators that has been identified as being potentially responsible for or contributing to a spill or other contamination at a Superfund site. Whenever possible, through administrative and legal action, U.S. EPA requires PRPs to clean up hazardous sites that have been contaminated.

PPB. See Parts Per Billion.

Preliminary Assessment and Site Investigation. The PA/SI is the process of collecting and reviewing available information about a known or suspected hazardous waste site or release. The PA/SI usually includes a visit to the site.

Proposed Plan. A plan for a site cleanup that is available to the public for comment.

PRP. See Potentially Responsible Party.

Public Comment Period. A formal opportunity for community members to review and contribute written comments on various U.S. EPA documents or actions.

Public Meeting. Formal public sessions that are characterized by a presentation to the public followed by a question-and-answer session. Formal public meetings may involve the use of a court reporter and the issuance of transcripts. Formal public meetings are required only for the proposed plan and record of decision amendments.

Public. The community or people in general or a part or section of the community grouped because of a common interest or activity.

Record of Decision. A ROD is a legal, technical and public document that explains which cleanup alternative will be used at a Superfund National Priorities List site. The ROD is based on information and technical analysis generated during the remedial investigation and feasibility study and consideration of public comments and community concerns.

RD/RA. See Remedial Design/Remedial Action.

Remedial Design/Remedial Action. Remedial design is a phase in the CERCLA response process in which technical drawings are developed for the chosen remedy, costs for implementing the remedy are estimated and roles and responsibilities of U.S. EPA, states and contractors are determined. During the remedial action phase, the remedy is implemented generally by a contractor, with oversight and inspection conducted by U.S. EPA, the state or both.

Remedial Investigation/Feasibility Study. The remedial investigation is a study designed to collect the data necessary to determine the nature and extent of contamination at a site. The feasibility study is an analysis of the practicality of a proposal—e.g., a description and analysis of potential cleanup alternatives for a site such as one on the National Priorities List. The feasibility study usually recommends a selection of a cost-effective alternative. It usually starts as soon as the remedial investigation is under way; together, they are commonly referred to as the remedial investigation/feasibility study.

Remedial Project Manager. The U.S. EPA official who is the technical lead on a project.

Responsiveness Summary. A summary of oral and/or written public comments received by U.S. EPA during a comment period on key U.S. EPA documents and U.S. EPA's responses to those comments.

RI/FS. See Remedial Investigation/Feasibility Study.

ROD. See Record of Decision.

RPM. See Remedial Project Manager.

Safe Drinking Water Act. The Safe Drinking Water Act, or SDWA, is the federal law that protects public drinking water supplies throughout the nation. Under the SDWA, U.S. EPA sets standards for drinking water quality and with its partners implements various technical and financial programs to ensure drinking water safety.

SDWA. See Safe Drinking Water Act.

SARA. See Superfund Amendments and Reauthorization Act.

Soil Gas. Gas or vapors in the small spaces between particles of the earth and soil.

Superfund Amendments and Reauthorization Act. Modifications to the Comprehensive Environmental Response, Compensation and Liability Act, enacted on October 17, 1986.

Superfund. The program operated under the legislative authority of CERCLA that funds and carries out U.S. EPA solid waste emergency and long-term removal and remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority and conducting and/or supervising cleanup and other remedial actions.

TCE. See Trichloroethene.

Tetrachloroethene. A chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products. Other names for include perchloroethylene, or PERC, PCE, and tetrachloroethylene. Much of the tetrachloroethylene that gets into water or soil evaporates into the air. High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness,

headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high." More information can be found on the following website: www.atsdr.cdc.gov/toxfaqs/tfacts18.pdf.

Trichloroethene. A chemical that is used as a solvent to remove oils and grease from metal products and is found in adhesives, paint removers, typewriter correction fluids and spot removers. TCE is colorless liquid with an odor similar to ether and is a manufactured substance which does not occur naturally in the environment. It minimally dissolves in water and can remain in groundwater for a long time. TCE evaporates from surface water and soil, although it evaporates less easily from soil. Exposure from TCE is most commonly through breathing air that has TCE vapors, drinking or showering in contaminated water, or direct contact with contaminated soil. Long-term exposure to this family of chemicals is suspected of causing cancer, as well as problems of the liver and weakening of the immune system. More information can be found on the following website: www.atsdr.cdc.gov/toxfaqs/tfacts19.pdf.

Vapor Intrusion. Occurs when underground pollutants release chemical vapors that travel up through the soil and accumulate beneath building foundations. Air in the building becomes polluted when vapors enter through cracks or holes in foundations and crawl spaces.

VOCs. See Volatile Organic Compounds.

Volatile Organic Compounds. A type of organic compound that tends to change from a liquid to a gas at low temperatures when exposed to air. As a result of this tendency, VOCs disappear more rapidly from surface water than from groundwater. Since groundwater does not come into contact with air, VOCs are not easily released and can remain in groundwater that is being used for drinking water, posing a threat to human health. Some VOCs are believed to cause cancer in humans.

Appendix B

Community Interview Questions

List of questions asked during community interviews are on the following page.

Community Interview Questionnaire
East and West Troy Contaminated Aquifer Sites – Dec 15-17, 2015

Name: _____

Address: _____

Home Phone: (____) _____ **Cell Phone:** (____) _____

E-Mail Address: _____ **Date:** _____

1. Do you live or work on or near the site(s)? If no, are you affiliated with any organization that has an interest in the site? [What organization]?
2. How long have you been a resident in the area?
3. What do you know about the site(s)?
4. What concerns do you have about the site(s)?
5. Where are you getting your information about the site(s)? From whom? In what form?
6. Do you feel that you have been adequately informed about the site(s) from EPA? If not, what other kind of information would you like/need?
7. What newspapers do you read? What television stations do you watch? What radio stations do you listen to?
8. How would you like to be informed concerning future site activities (mail, e-mail, telephone, newspapers, television, radio, social media such as Facebook)?
9. If EPA holds a public meeting or availability session, would you attend? Yes ____ No ____
 - a. What day and time would be most convenient for you?
 - b. What format do you think works best? Public meeting verses availability session? (explain formats)
 - c. If not, what obstacles keep you from attending?
 - d. Do you have suggestions about locations for future meetings?
10. Have you received or read any EPA fact sheets about the site(s)? If so, were they understandable?
11. Site information is posted on the EPA's web site(s). Have you used the EPA web site(s)? If so, did you find the information you needed?
12. An information repository is located at the Troy Miami County Public Library. Have you ever looked at the site information at the library? If so, did you find the information you needed?
13. Are there any other people or groups you think we should talk to about the site(s) either because they have unique information or would like to know more from EPA?
14. What is special/important to you about your community?
15. Do you have any questions?
16. Is there anything else you would like to add regarding the site(s) or the EPA's involvement with the local community?

Appendix C

Information Repository, Administrative Record, Websites and Public Meeting Locations

Local Information Repository

Troy-Miami County Public Library

Local History Branch

100 W. Main St.

Troy, OH 45373

937-335-4082

Hours of operation:

Monday & Wednesday: 10 a.m. – 8 p.m.

Tuesday, Thursday, Friday: 10 a.m. – 4 p.m.

Saturday: 9 a.m. – 1 p.m.

Official Information Repository

U.S. EPA Region 5 Superfund Record Center

Room 711, 7th Floor

Ralph Metcalfe Federal Building

77 W. Jackson Blvd.

Chicago, IL 60604



U.S. EPA Site Web Page

www.epa.gov/superfund/east-troy-aquifer

Possible Meeting Locations

Van Cleve 6th Grade Building

617 E. Main St.

Troy, OH 45373

937-332-6780

Forest Elementary School

413 E. Canal St.

Troy, OH 45373

937-332-6746

St. Patrick School

420 E. Water St.

Troy, OH 45373

937-339-3705

Troy High School

151 W. Staunton Road

Troy, OH 45373

937-332-6710

(Community members suggested the high school saying it had a large auditorium with theater seating if we should need a larger space.)

Troy City Hall

100 S. Market St.

Troy, OH 45373

937-339-1221

Lincoln Community Center

110 Ash St.

Troy, OH 45373

937-335-2715

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Appendix D

List of Contacts (Information is current as of February 2017)

U.S. Environmental Protection Agency Officials

Shari Kolak

Remedial Project Manager
East Troy Contaminated Aquifer
Superfund Division, SR-6J
U.S. EPA
77 W. Jackson Blvd.
Chicago, IL 60604
312-886-6151 or 800-621-8431 ext. 66151
kolak.shari@epa.gov



Adrian Palomeque

Community Involvement Coordinator
Superfund Division SI-6J
U.S. EPA
77 W. Jackson Blvd.
Chicago, IL 60604
312-353-2035 or 800-621-8431 ext. 32035
palomeque.adrian@epa.gov

Federal Elected Officials

Robert Portman

Senator
448 Russell Senate Office Building
Washington, DC 20510
202-224-3353
www.portman.senate.gov/public/index.cfm/contact-form

Cincinnati Office
312 Walnut St., Suite 3075
Cincinnati, OH 45202
513-684-3265

Sherrod Brown

Senator
713 Hart Senate Office Bldg.
Washington, DC 20510
202-224-2315
www.brown.senate.gov/contact/

Columbus Office
200 N. High St., Room 614
Columbus, OH 43215
614-469-2083

Warren Davidson

U.S. Representative
1004 Longworth House Office Bldg.
Washington, DC 20515
202-225-6205
<https://davidson.house.gov/contact>

Miami County Office
12 S. Plum St.
Troy, OH 45373
937-339-1524

State Elected Officials

John Kasich

Governor

Riffe Center, 30th Floor

Columbus, OH 43215-6117

614-466-3555

<http://www.governor.ohio.gov/Contact/ContacttheGovernor.aspx>

Bill Beagle (District 5)

State Senator

1 Capitol Square, 2nd Floor

Columbus, OH 43215

614-466-6247

www.ohiosenate.gov/beagle/contact

Stephen A. Huffman (District 80)

State Representative

77 S. High St., 12th Floor

Columbus, OH 43215

614-466-8114

www.ohiohouse.gov/stephen-a-huffman/contact

Mike DeWine

Attorney General

30 E. Broad St., 14th Floor

Columbus, OH 43215

614-466-4986

www.ohioattorneygeneral.gov/About-AG/contact

Jon Husted

Secretary of State

180 E. Broad St., 16th Floor

Columbus, OH 43215

614-466-2655

877-767-6446 (toll-free)

<https://www.sos.state.oh.us/sos/>

Ohio Environmental Protection Agency Officials

Madelyn Adams

Site Coordinator

Division of Environmental
Response and Revitalization

Ohio EPA, Southwest District Office

401 E. 5th St.

Dayton, OH 45402

937-285-6456

madelyn.adams@epa.ohio.gov



Ohio Department of Health Officials

Bob Frey, Geologist

Ohio Department of Health

Bureau of Environmental Health and Radiation
Protection

Health Assessment Section

246 N. High St.

Columbus, OH 43215

614-466-1390

bob.frey@odh.ohio.gov



Miami County Officials

Board of Miami County Commissioners

Safety Building

201 W. Main St.

Troy, OH 45373

937-440-5910



John F. Evans

Commissioner (President)

commissioners@miamicountyohio.gov

John W. O'Brien

Commissioner (Vice-President)

commissioners@miamicountyohio.gov

Gregory A. Simmons

Commissioner

commissioners@miamicountyohio.gov

Leigh M. Williams

Clerk/Commissioners' Administrator
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Paul P. Huelskamp

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Troy, OH 45373
937-440-5656
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Jeff Shields

Superintendent, Water & Sewer
Sanitary Engineering
2200 N. County Road 25A
Troy, OH 45373
937-440-5653
jshields@miamicountysed.com

Dennis Propes

Health Commissioner
Miami County Public Health
510 W. Water St. Suite 130
Troy, OH 45373
937-573-3505
dpropes@miamicountyhealth.net

Dave Duchak

Miami County Sheriff
201 W. Main St.
Troy, OH 45373
937-440-6085
adminassist@miamicountyso.com

City of Troy**Michael Beamish**

Mayor
City Hall
100 S. Market St.
Troy, OH 45373
937-339-1221
mayor.beamish@troyohio.gov

City Council/City Offices

100 S. Market St.
Troy, OH 45373
937-335-1725
The council meets at 7 p.m. the first and third Monday of every month.

**Sue G. Knight**

Clerk of Council
937-335-1725
sue.knight@troyohio.gov

Martha A. Baker

President
937-335-6397
martha.baker@troyohio.gov

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937-339-7110
thomas.kendall@troyohio.gov

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doug.tremblay@troyohio.gov

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937-524-9162
john.schweser@troyohio.gov

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937-335-6989
bobby.phillips@troyohio.gov

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Fifth Ward
937-418-5502
bill.twiss@troyohio.gov

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Sixth Ward
937-332-6959
brock.heath@troyohio.gov

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937-339-0939
robin.oda@troyohio.gov

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Councilwoman-at-Large
937-524-8629
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John L. Terwilliger
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Director of Public Service and Safety
937-335-1725
patrick.titterington@troyohio.gov

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215 W. Water St.
Troy, OH 45373
937-339-1500
grant.kerber@troyohio.gov

Jim Dando
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102 S. Market St.
City Hall South Annex
Troy, OH 45373
937-339-9601
jim.dando@troyohio.gov

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Planning & Zoning
102 S. Market St.
City Hall South Annex
Troy, OH 45373
937-339-9481
tim.davis@troyohio.gov

Charles Phelps
Chief of Police
Police Department
124 E. Main St.
Troy, OH 45373
937-339-7525
No email listed

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Fire Department
1528 N. Market St.
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937-335-5678
matthew.simmons@troyohio.gov

Concord Township

Thomas N. Mercer
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1150 Horizon West Court
Troy, OH 45373
937-339-1492
TMercer@Concord-Township.com

Don Pence
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1150 Horizon West Court
Troy, OH 45373
937-339-1492
DPence@Concord-Township.com

William B. Whidden
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1150 Horizon West Court
Troy, OH 45373
937-339-1492
WWhidden@Concord-Township.com

Pat Quillen
Fiscal Officer
1150 Horizon West Court
Troy, OH 45373
937-339-1492
PQuillen@Concord-Township.com

Neal Rhoades
Road Superintendent
1150 Horizon West Court
Troy, OH 45373
937-339-1492
NRhoades@Concord-Township.com

Interested Parties

The Troy Area Chamber of Commerce

405 SW Public Square, Suite 330
Troy, OH 45373
937-339-8769
TACC@TroyOhioChamber.com

Troy Development Council

405 SW Public SQ, Suite 330
Troy, OH 45373
937-339-7809
www.troyeconomicdevelopment.com

Troy Main Street

405 SW Public SQ, Suite 231
Troy, Ohio 45373
937-339-5455



Newspapers

Troy Daily News

224 S. Market St.
Troy OH, 45373
937-335-5634
<http://tdn-net.com/>
Publishes daily (except Tuesday)

Troy Tribune

114 S. Main St.
New Carlisle, OH 45344
937-669-2040
www.troytrib.com/index.php
Free weekly community newspaper

Dayton Daily News

1611 S. Main St.
Dayton, OH 45409
937-222-5700
www.daytondailynews.com
Publishes daily

Radio

WTJN 107.1

Troy Community Radio
315 Public Square, Suite 216
Troy, OH 45373
937-339-1071
www.tcrtroycommunityradio.com/

Television

WHIO-TV 7, CBS

1414 Wilmington Ave.
Dayton, OH 45420
937-259-2111
7online@whiotv.com

WDTN-TV 2, NBC

4595 S. Dixie Dr.
Dayton, OH 45439
937-293-2101
newstips@wdtn.com

WKEF, ABC22/FOX45

45 Broadcast Plaza
Dayton, OH 45408
937-263-4500
comments@abc22now.com

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Appendix E

Community Engagement and the Superfund Process



Superfund is an environmental cleanup program enabled by a federal law enacted in 1980 known as the **Comprehensive Environmental Response, Compensation, and Liability Act**, or **CERCLA**, also called Superfund.

In 1986, another law, the

Superfund Amendments and Reauthorization Act, or **SARA**, reauthorized CERCLA to continue Superfund cleanup activities. The CERCLA law gives U.S. EPA the authority to require those parties responsible for creating hazardous waste sites to clean up those sites or to reimburse the government if U.S. EPA cleans up the site. U.S. EPA compels responsible parties to clean up hazardous waste sites through administrative orders, consent decrees and other legal settlements. U.S. EPA is authorized to enforce the Superfund laws within Indian reservations, in all 50 states and in U.S. territories. Superfund site identification, monitoring and response activities are coordinated with state, tribal and territorial environmental protection or waste management agencies.

There are several steps involved in cleaning up a contaminated site. Once U.S. EPA has been made aware of a contaminated site from individual citizens, local, tribal or state agencies or others, U.S. EPA follows a step-by-step process (*see the next page of this Appendix*) to determine the best way to clean up the site and protect human health and the environment.

If the site poses an immediate threat to public health or the environment, U.S. EPA can intervene with an emergency response action. The goal of U.S. EPA's Emergency Response and Removal Program is to protect the public and the environment from immediate threats posed by the release or discharge of hazardous substances.

The Superfund program encourages active dialogue between communities affected by the release of hazardous substances and all of the agencies responsible for carrying out or overseeing cleanup actions. U.S. EPA considers community involvement to be an important part of the Superfund program and opportunities for community involvement occur throughout the process. At each step in the process, there are opportunities for various levels of community involvement (*see the following page for more details*).

Visit these U.S. EPA websites for more information on the Superfund process.

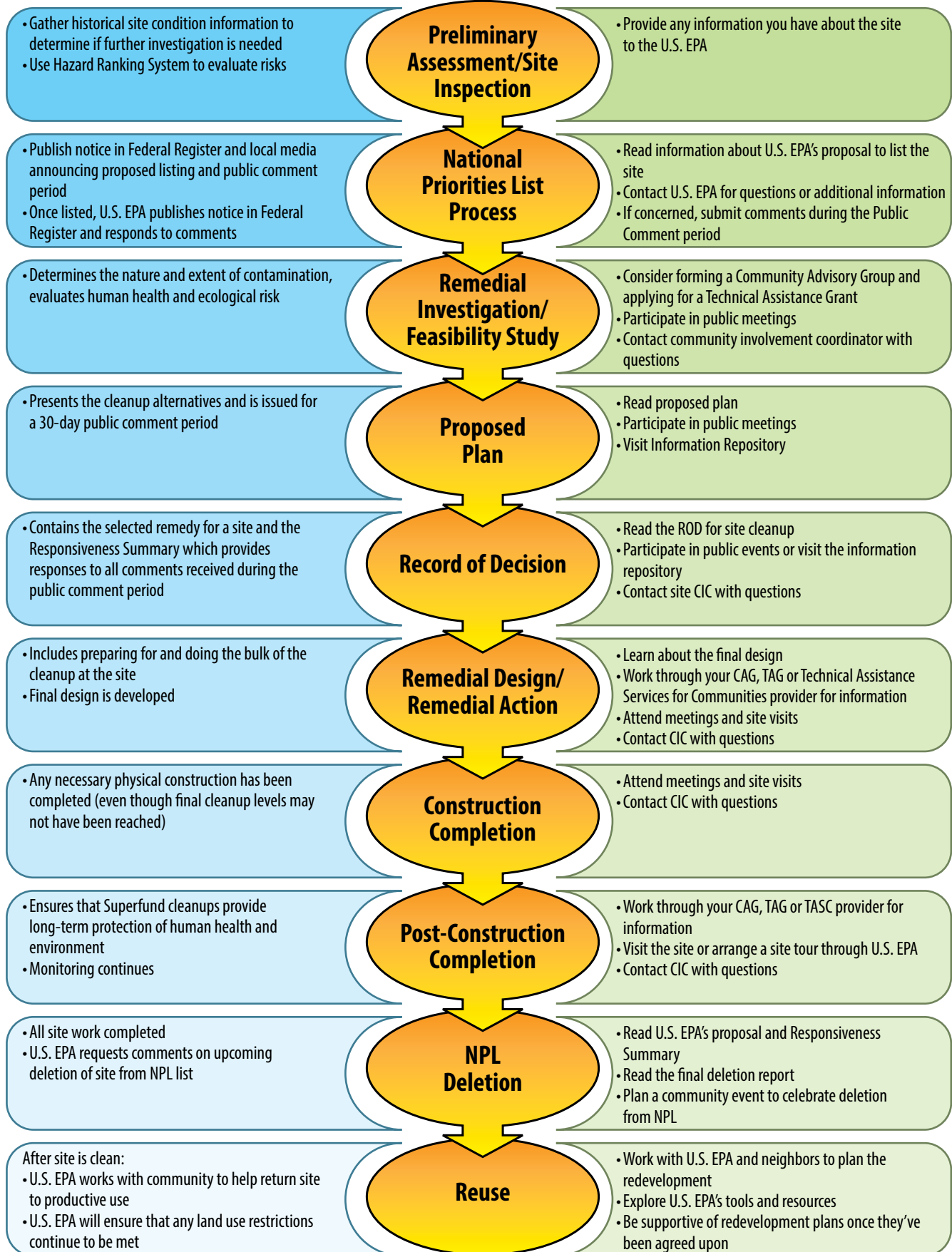
Superfund: www.epa.gov/superfund

Cleanup Process: <https://www.epa.gov/superfund/cleaning-superfund-sites>

Community Involvement: <https://www.epa.gov/superfund/superfund-community-involvement>

Superfund Process Steps

Community Involvement Opportunities



Appendix F

Fact Sheets

U.S. EPA's site-related fact sheets and additional fact sheets on contaminants of concern and vapor intrusion

➤ **U.S. EPA's site-related fact sheets:**

EPA Investigation Finds High Vapor Levels - East Troy Contaminated Aquifer Site - August 2006

Two Studies Mark Beginning of Cleanup - East Troy Contaminated Aquifer Site - July 2010

EPA Checking for Possible Vapor Problems - East Troy Contaminated Aquifer Site - October 2011

➤ **Additional fact sheets on contaminants of concern**

- **ATSDR Fact Sheets:**

Bromodichloromethane

Chloroform

cis 1,2-dichloroethene

Dibromochloromethane

Tetrachloroethylene (Tetrachloroethene)

Trichloroethylene (Trichloroethene)

- **ODH Fact Sheets:**

cis 1,2-dichloroethene

Tetrachloroethylene (Tetrachloroethene)

Trichloroethylene (Trichloroethene)

Vapor Intrusion



Region 5 Cleanup Sites

You are here: [EPA Home](#) [Region 5](#) [Where You Live](#) [Cleanup Sites](#) EPA Investigation Finds High Vapor Levels

EPA Investigation Finds High Vapor Levels

August 2006 fact sheet

U.S. Environmental Protection Agency's investigation of chemical pollution underneath sections of Troy found elevated levels of fumes are seeping into some buildings, but the Agency and its state and local partners are now considering ways to solve the problem and protect people's health. The EPA study this summer confirmed a city of Troy investigation last spring that found vapors given off from contaminated underground water were moving into schools, a church, the city police station and several homes. This June Ohio EPA asked EPA's emergency response branch for help in dealing with the vapor intrusion problem. Health officials believe the fumes aren't strong enough to cause health problems in the short term, but over the long run something will need to be done to head off potential sickness.

EPA sampled 15 locations in Troy looking for gas that might be present in the soil underneath the buildings. This type of testing is called sub-slab sampling. It is more reliable than simply taking indoor air samples because common consumer products such as paint and cleaners give off small amounts of fumes that could affect sampling results. At 10 of the 15 sampling locations EPA found soil-vapor concentrations that do not meet health standards set by Ohio Department of Health. The 10 locations of concern include two schools, a church, the police station and six homes.

Chemical called PCE

The contamination comes from a chemical called tetrachloroethylene, more commonly known as PCE. It is in a class of chemicals called volatile organic compounds or VOCs, which are made from petroleum and easily produce vapors. PCE is used in dry cleaning and as an industrial degreaser. In 2004, Ohio EPA discovered PCE had soaked through the ground and got into underground water supplies (called ground water in environmental terms) and had formed a mass or plume of contamination. The PCE carried along in the slow-moving plume is giving off vapors that move to the surface. The PCE fumes can seep through cracks, holes and pipes in building foundations.

Representatives from EPA, Ohio EPA and Ohio Department of Health briefed school, church and city officials as well as residents in the affected homes and the media about the vapor intrusion problem. At high concentrations or over a long period of time, breathing PCE fumes can cause health problems.

Residents of highly industrialized countries such as the United States daily come in contact with chemicals. People can get sick from chemical exposure, but getting sick depends on several factors. One of these is how much of the chemical enters the body. Other important factors are how long or how often a person is exposed to the pollutant. And general health, age and lifestyle also play a role in whether sickness will happen from chemical exposure.

The latest sampling showed PCE vapor levels won't cause immediate illness, but are high enough to be of future concern. EPA, state and local officials are studying various short- and long-term options for fixing the problem.

Testing will begin this spring 2010 and will involve machinery and trucks, including equipment to drill ground water monitoring wells. You should expect to see additional truck traffic and workers in, probably in April and May. Some workers may be wearing protective clothing, which is required by law.

Next steps

Once this initial investigation is done, EPA will develop a proposed plan. This document explains several possible cleanup methods. It will explain in detail the option EPA considers the most appropriate, cost-effective way to clean up the pollution. You and your neighbors will have an opportunity to learn about the proposed plan and tell EPA what you think about it. After public comments have been considered, EPA may revise its recommendation based on those comments before publishing a final cleanup plan, known to EPA as a "record of decision." You will have an opportunity to comment on the final plan before cleanup work begins, probably sometime in 2012.

Site background

On June 30, 2006, Ohio EPA requested U.S. EPA assistance in conducting a time-critical removal action at the East Troy Contaminated Aquifer Site. Ohio EPA investigations show that groundwater is contaminated with tetrachloroethene (PCE) from two or more sources. Wells within the Troy east well field have been impacted with VOCs at concentrations below maximum contaminant levels (MCLs). PCE and other VOCs have been detected in indoor air samples collected by the city of Troy from several occupied structures including the Troy police station, a church, and a school.

Ohio EPA noted that residences and other occupied structures above and adjacent to the ground water plumes are at risk for exposure to VOCs through vapor intrusion from soil gas to indoor air. Ohio EPA requested U.S. EPA to conduct a removal action assessment to determine the extent of vapor intrusion contamination and to mitigate levels of VOCs in indoor air that exceed screening levels established by the Agency for Toxic Substances and Disease Registry (ATSDR) and Ohio Department of Health (ODH).

From July 2006 through April 2007, the U.S. EPA collected sub-slab and indoor air samples from a total of 85 locations, which included 78 residences, 2 churches, 4 schools and the Troy Police Station during Phase 1 and Phase 2 air sampling activities. By April 2008, 16 residences and one elementary school met the criteria for a VAS based on sub-slab and indoor air sampling. All 17 structures have a VAS installed.

The site was placed on the National Priorities List – better known as Superfund – in September 2008. Being on the Superfund list made the site eligible for federal funding.



Two Studies Mark Beginning of Cleanup

East Troy Contaminated Aquifer Site
Troy, Ohio

July 2010

You are invited

EPA will hold a public meeting to update residents about the investigation and cleanup of the ground water in East Troy.

Date: July 15

Time: 6:30 p.m.

Place: Troy Junior High School
556 Adams St.
Troy

If you have questions or need special accommodations at the meeting contact Don de Blasio. His contact information is listed below.

Information repository

You may review site documents at:
Troy-Miami Public Library
419 W. Main St.
Troy

Or visit:

www.epa.gov/region5/sites/troyvoc

For more information

To learn more about the East Troy Contaminated Aquifer site, contact one of these team members:

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An investigation is scheduled to begin this summer in the first step toward cleaning up ground water contamination at the East Troy Contaminated Aquifer site. U.S. Environmental Protection Agency will begin the first of two studies on polluted ground water underneath the site. The site includes a 20-block portion of the city of Troy, adjacent to the downtown portion of the city east of Market Street, south of the Great Miami River, west of Williams Street and north of Race Street.

The first study, known as a “remedial investigation,” is designed to find out where the contamination is and how widespread it is. EPA will do extensive testing to map out the area contaminated by what are called “volatile organic compounds.”

VOCs are a group of chemicals used in solvents, paints and dry-cleaning fluid. Breathing low levels of VOCs for long periods may cause an increase in health risks. Two such compounds confirmed in the ground water at the site are trichloroethene, or TCE, and tetrachloroethene, or PCE. EPA suspects these chemicals were used by former dry cleaning or metal cleaning businesses that operated in the area. During the remedial investigation, EPA will do extensive testing within the area of polluted ground water. EPA will test the ground water and the soil, as well as the surface water and sediment (mud) within the Great Miami River.

Once this investigation is complete, EPA will conduct a “feasibility study.” The purpose of this second study is to look at a range of options for cleaning up the contamination. The site was placed on the National Priorities List in September 2008 making it eligible for federal money for the investigation and cleanup under EPA’s Superfund program.

Previous investigations conducted by EPA and Ohio EPA from July 2006 to April 2007 confirmed the presence of VOCs in ground water, soil and in the indoor air of some residential, public and commercial buildings. Sampling of gas in the soil beneath the buildings and the air inside them has confirmed that the VOCs are moving up through the soil and into the structures through cracks in foundations. This process is called “vapor intrusion.” In response, from June 2007 to April 2008, EPA installed systems in 16 homes and one school to remove the vapors.

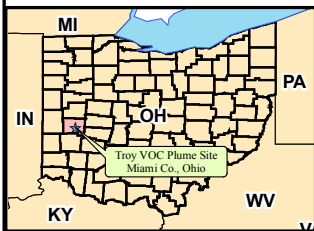
Testing to be done at some homes

EPA will also take soil gas samples from more homes within the area of polluted ground water to help determine the extent of the vapor intrusion. The results of the ground water and soil testing will be used to determine which homes will be tested. If your home is selected, EPA will contact you to get permission for the testing. This testing will be done by taking a soil gas sample from beneath the foundation of your house. This is done by drilling one or two holes about an

Map of Site Investigation Area



Image Source: City of Troy



Legend

U.S. EPA Site Investigation Area

Scale: 0 0.05 0.1 Miles



Prepared for:
U.S. EPA REGION V
Contract No: EP-S5-06-04

SITE LOCATION MAP
TROY VOC PLUME SITE
TROY, MIAMI COUNTY, OHIO
June 2010

inch wide and 8 inches deep through the basement floor. A sensor is then inserted into the hole and attached to a canister that stays in place for 24 hours to measure gases in the soil. This is the same sampling technique that was used during previous EPA investigations in 2006-2007.

All this testing is done at no cost to you and is completely safe. The tests are designed to protect your family's health. EPA will let you know if the test results show any contamination under your house, and whether the air inside your house should be tested. EPA will prepare a plan for cleaning up any contaminants that are found in indoor air at unsafe levels.

Testing will begin this summer and will involve machinery and trucks, including equipment to drill ground water monitoring wells. You should expect to see additional truck traffic and workers, probably in July and August. Some workers may be wearing protective clothing, which is required by law.

Public Health Assessment

The Ohio Department of Health, in cooperation with the Agency for Toxic Substances and Disease Registry, or ATSDR, has released for public comment a draft of the

Public Health Assessment for the East Troy Contaminated Aquifer site. Comments will be accepted through July 12, 2010. The document is available for review on the Ohio Department of Health web page: <http://www.odh.ohio.gov>. Information on how to comment on the document is included on the web site.

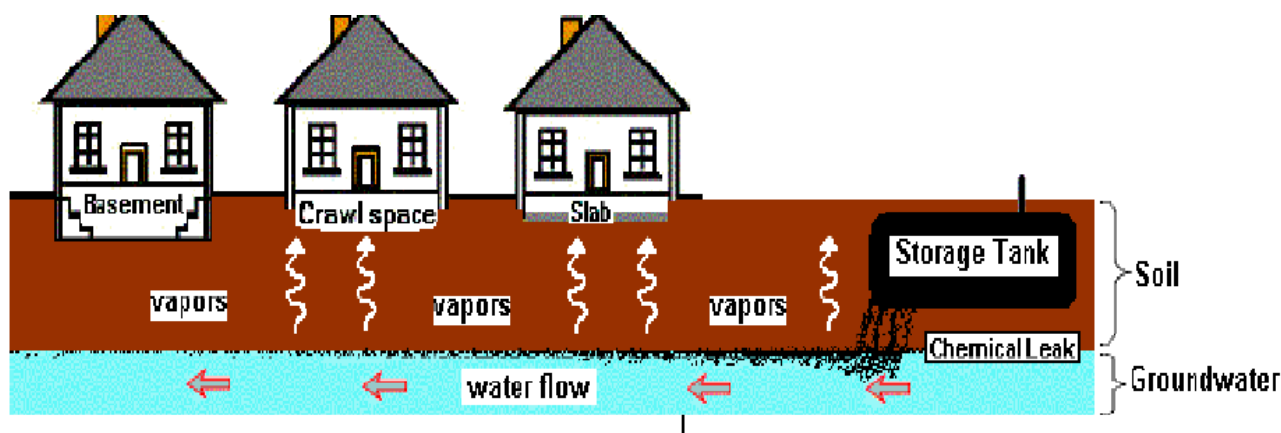
Health representatives from ODH will be also be available at the meeting to answer questions about the Troy site.

Next steps


Once these studies are done, EPA will develop a proposed plan. This document explains several possible cleanup methods. It will explain in detail the option EPA considers the most appropriate, cost-effective way to clean up the pollution. You and your neighbors will have an opportunity to learn about the proposed plan and tell EPA what you think about it. After public comments have been considered, EPA may revise its recommendation based on those comments before publishing a final cleanup plan known to EPA as a "record of decision." You will have an opportunity to comment on the final plan before cleanup work begins.

What is vapor intrusion?

Volatile chemicals in contaminated soil and groundwater can evaporate causing vapors. Vapor intrusion is a process when these vapors move through soil and into the basements through cracks in foundations and into indoor spaces of homes and other buildings. (See graphic below.)



**YOU ARE INVITED
TO A
PUBLIC MEETING
(SEE DETAILS INSIDE)**

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**EAST TROY CONTAMINATED AQUIFER SITE:
Two Studies Mark Beginning of Cleanup**

United States
Environmental Protection
Agency
Region 5
Superfund Division (SI-7J)
77 W. Jackson Blvd.
Chicago, IL 60604-3590





EPA Checking for Possible Vapor Problems

East Troy Contaminated Aquifer Site

Troy, Ohio

October 2011

Community meeting

EPA will hold a public meeting to talk about the vapor intrusion investigation at the East Troy Contaminated Aquifer site at 7 p.m., Wednesday, Oct. 19, 2011, at Van Cleve 6th Grade School, 617 E. Main St., Troy.

EPA representatives will discuss results from a 2010 sampling project performed in the target neighborhood. In that investigation the ground water (underground water supplies), surface water and sediment (mud) were checked for hazardous chemical pollution. Agency staffers will also explain how vapor samples are taken under and inside homes and buildings.

EPA needs property owners to grant permission for sub-slab and indoor air samples to be taken. This is very important in order to protect the health of residents. The sampling is very inconspicuous and the resulting information is needed to keep people safe from potential indoor air pollution. Access agreement forms to sign giving EPA permission to take samples will be available at the meeting.

If you have questions or need special accommodations at the meeting contact Don de Blasio. His contact information is listed on the back page.

This fall the U.S. Environmental Protection Agency will install 14 new monitoring wells around the East Troy Contaminated Aquifer site to collect underground water samples and will also test additional homes for a potential pollution problem called “vapor intrusion.” Vapor intrusion occurs when chemical pollutants in the underground water or soil give off dangerous gases that can rise through the earth and seep into buildings through foundation cracks and holes, causing unsafe levels of indoor air pollution. A family of chemicals called “volatile organic compounds” or VOCs are especially prone to vapor intrusion. In this case, investigators are concerned about VOCs called trichloroethylene or TCE and tetrachloroethylene or PCE, which were used as industrial solvents and dry cleaning chemicals in businesses in the area.

EPA wants to check for potential vapor intrusion issues in a 20-block area south of the Great Miami River near downtown Troy. Monitoring is done by two methods. One method called “sub-slab” testing checks the soil underneath foundations for trapped vapors. The other method simply tests indoor air for pollutants. Both types of samples are usually collected at the same time to ensure the most accurate assessment. If property owners grant permission, EPA would like to collect sub-slab vapor and indoor air samples this fall. Initially, the Agency would like to test 40 homes followed by more homes as the investigation proceeds. Depending on the results of the data collection, EPA may request permission from property owners to sample as many as 200 buildings during this investigation.

Who will be tested

Homes targeted for sampling in this latest round of monitoring are:

- Previously untested homes located above the highest known concentrations of ground water contamination.
- Homes not tested during the 2006-2008 EPA investigation that are close to other locations where EPA identified vapor intrusion concerns, including those that EPA could not get permission from property owners for sampling at that time.

As the investigation continues, EPA will test previously sampled homes that were found with high levels of PCE or TCE in the soil gas underneath the foundations but not in the indoor air. EPA will also re-test homes and one school that have existing vapor removal systems to confirm the equipment is working properly.

For the homes tested this fall, a second round of sub-slab tests in addition to indoor air samples will be collected in spring 2012. New Ohio EPA guidance on vapor intrusion monitoring requires the collection of two rounds of sub-slab tests to account for seasonal variations in soil gas concentrations.

Not all homes within the 20-block target area will be tested. If your home meets the criteria and is selected for testing, an EPA contractor will contact

Ask for an ID

All Agency personnel and contractors carry identification to assure residents they are working for EPA.

you to schedule an appointment to discuss the situation. EPA needs a signed access agreement before testing. Testing is important to protect the health of occupants from possible indoor air pollution.

Sampling equipment

EPA will use a “Summa” canister to collect sub-slab vapor and indoor air samples. For sub-slab testing, one or two small holes are made in the basement, slab or crawl space floor and a temporary sampling port (a very small diameter tube) is installed and sealed in place in each hole. The tubes are placed in a spot most likely to be an entry point for contaminated vapors. The canister is attached to the tube to collect the samples. For testing indoor air, the canister is placed on a table. Canisters are generally left in place for 24 hours or less. It is then sent to a laboratory for analysis. The results for your home will be shared only with homeowners and government agencies involved in the cleanup, not with the public. EPA will cap the sampling ports and leave them in place for a second round of testing. Two rounds of samples are needed to determine accurately if vapor intrusion is a concern.

If EPA, working with state and local health agencies, determines contaminated vapors are entering your home, an unobtrusive removal system can be installed to make your home safer. There is no charge to you for the equipment or installation if that becomes necessary.

If your home is within the shaded area on the map on Page 3, EPA may contact you to schedule an appointment. EPA will explain to the homeowner or tenant the sampling process, answer questions, identify sampling locations, review instructions and perform a general building survey to determine likely sources of household products such as paint and cleaners that can affect results. A date and time for sampling will also be scheduled during the visit.



In this example of “sub-slab” sampling, tubing is run from underneath a basement floor to a “Summa” canister to test for hazardous vapors trapped in the soil.

Underground water and soil sampling

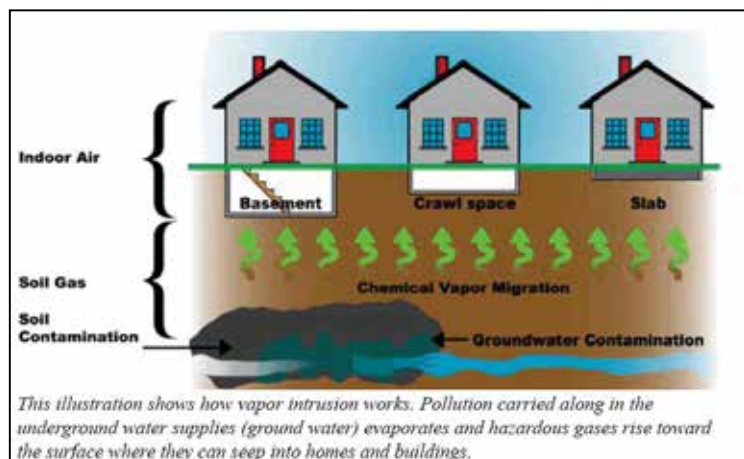
EPA will also sample underground water supplies (called “ground water” in environmental terms) and soil in two phases beginning this fall. During the first phase, 33 ground water samples will be collected from the 14 new monitoring wells mentioned above and 19 existing wells. The purpose of this sampling is to better define the extent of the ground water contamination under the site. The majority of the new monitoring wells will be installed in public right-of-ways, not on private property. EPA will obtain written permission from the city to put in the new monitoring wells. Depending on the results of the first phase of ground water sampling, additional monitoring wells may be installed and samples collected during a second phase of testing.

In the first phase of soil sampling, EPA will drill 30 soil borings, mostly in city right-of-ways. A total of 60 soil samples will be collected from these holes. The soil investigation is being conducted to locate potential source areas. Source areas are pockets of contamination that

release contaminants to the ground water over time as rainwater and snow melt move through the soil. Since it is likely multiple source areas are present at the site, and depending on first-phase results, EPA will probably add additional soil borings and collect more samples during the second phase of the investigation.

Site history

The East Troy Contaminated Aquifer site covers a 20-block portion of the city of Troy. The site is bordered to the north by the Great Miami River, to the west by Market Street, to the east by Williams Street and to the south by Race Street. Several former dry cleaners and metal cleaning businesses that once operated in the



area are believed to have used PCE and TCE that were released to the environment.

In July 2010, EPA began an in-depth inquiry called a “remedial investigation/feasibility study” or RI/FS. This is part of EPA’s Superfund process to manage the nation’s hazardous waste sites. A remedial investigation is a study of the nature and extent of contamination at a cleanup site, while the feasibility study proposes and evaluates cleanup options. As part of the RI/FS, sampling was conducted last year and more samples will be collected this fall.

Over the past year, EPA collected ground water samples from 19 monitoring wells. The Agency also collected surface water and sediment (mud) samples from the Great Miami River to determine whether it was being affected by the ground water contamination. No site-related contaminants were found in the surface water or river sediment. Results of EPA’s testing and additional testing by other parties indicates the ground water “plume” extends farther east than originally thought. A plume is a mass of contaminated ground water. All homes in the area are connected to the municipal water system that is routinely tested and meets EPA safe drinking water standards.

Map of Site Investigation Area



Next steps

Once the remedial investigation is done, EPA can prepare the feasibility study, which proposes and compares cleanup alternatives. The cleanup alternatives will be evaluated against criteria including effectiveness, overall protection and cost. EPA will then propose a cleanup plan for the site and explain its justification for picking a certain option. You and your neighbors will have an opportunity to learn about the proposed plan and tell EPA what you think about it. After public comments have been considered, EPA may revise

its recommendation based on those comments before publishing a final cleanup plan known as a “record of decision.” You will have an opportunity to comment on the final plan before work begins.

EPA will let you know if test results show any contamination under your house or in the air inside your house. If unsafe levels of air pollution are found in your home, EPA will prepare a plan for clearing up the problem and consult with you about it.

For more information

To learn more about the East Troy Contaminated Aquifer site, contact one of these team members:

Don de Blasio

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Superfund Division (SI-7J)
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Troy

Documents can also be found online at:

<http://www.epa.gov/region5/cleanup/troyvoc>

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EAST TROY CONTAMINATED AQUIFER SITE: EPA Checking for Possible Vapor Problems

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Environmental Protection
Agency
Region 5
Superfund Division (SI-7J)
77 W. Jackson Blvd.
Chicago, IL 60604-3590



This fact sheet answers the most frequently asked health questions (FAQs) about bromodichloromethane. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Most bromodichloromethane is formed as a by-product when chlorine is added to water-supply systems. Bromodichloromethane is not known to cause adverse health effects in people, but animal studies show that high concentrations can damage the liver and kidneys and affect the brain. Bromodichloromethane has been found at 5 of the 1,518 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is bromodichloromethane?

(Pronounced brō'mō di-klôr'ō mēth'ān')

Bromodichloromethane is a colorless, nonflammable liquid. Small amounts are formed naturally by algae in the oceans. Some of it will dissolve in water, but it readily evaporates into air.

Only small quantities of bromodichloromethane are produced in the United States. The small quantities that are produced are used in laboratories or to make other chemicals. However, most bromodichloromethane is formed as a by-product when chlorine is added to drinking water to kill bacteria.

What happens to bromodichloromethane when it enters the environment?

- ☐ Bromodichloromethane released to air is slowly broken down by reactions with other chemicals and sunlight or it can be removed by rain.
- ☐ In water, it will evaporate to the air and/or be broken down slowly by bacteria.

- ☐ When released to soil, most will evaporate to the air but some of it will be broken down by bacteria.
- ☐ Some bromodichloromethane may filter into the groundwater.
- ☐ Bromodichloromethane does not build up in the food chain.

How might I be exposed to bromodichloromethane?

- ☐ The most likely way people are exposed to bromodichloromethane is by drinking chlorinated water.
- ☐ You may breathe vapors released from chlorinated water in a swimming pool or in the home (cooking, washing dishes, bathing, etc.).
- ☐ Some bromodichloromethane may enter your body directly through your skin when bathing or swimming.
- ☐ People who live near a waste site containing bromodichloromethane could be exposed by drinking contaminated groundwater or breathing vapors released to the air.
- ☐ People who work at or live near a laboratory or factory that makes or uses this chemical could be exposed by breathing bromodichloromethane in the air.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

How can bromodichloromethane affect my health?

No studies are available regarding health effects in people exposed to bromodichloromethane.

Animal studies indicate that the liver, kidney, and central nervous system are affected by exposure to bromodichloromethane. The effects of high doses on the central nervous system include sleepiness and incoordination. Longer exposure to lower doses causes damage to the liver and kidneys. There is some evidence from animal studies that bromodichloromethane may cause birth defects at doses high enough to make the mother sick. It is not known if lower doses would cause birth defects.

How likely is bromodichloromethane to cause cancer?

There is evidence that eating or drinking bromodichloromethane causes liver, kidney, and intestinal cancer in rats and mice. The Department of Health and Human Services (DHHS) has determined that bromodichloromethane is reasonably anticipated to be a human carcinogen.

Is there a medical test to show whether I've been exposed to bromodichloromethane?

Methods are available to measure low levels of bromodichloromethane in human blood, breath, urine, and fat, but not enough information is available to use such tests to predict if any health effects might occur. Because special equipment is needed, these tests are not usually done in the doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a Maximum Contaminant Level (MCL) of 0.1 parts per million (ppm) for the combination of bromodichloromethane and a group of similar compounds (called trihalomethanes) that occur in chlorinated water. The EPA recommends that levels of halomethanes in lakes and streams should be limited to 0.19 ppm to prevent possible health effects from drinking water or eating fish contaminated with this group of chemicals.

Any release to the environment greater than 5,000 pounds of bromodichloromethane must be reported to the EPA.

The federal recommendations have been updated as of July 1999.

Glossary

Carcinogen: A substance that can cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

National Priorities List: A list of the nation's worst hazardous waste sites.

ppm: Parts per million.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. Toxicological profile for bromodichloromethane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about chloroform. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chloroform can occur when breathing contaminated air or when drinking or touching the substance or water containing it. Breathing chloroform can cause dizziness, fatigue, and headaches. Breathing chloroform or ingesting chloroform over long periods of time may damage your liver and kidneys. It can cause sores if large amounts touch your skin. This substance has been found in at least 717 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is chloroform?

(Pronounced klôr'ə-fôrm')

Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. It will burn only when it reaches very high temperatures.

In the past, chloroform was used as an inhaled anesthetic during surgery, but it isn't used that way today. Today, chloroform is used to make other chemicals and can also be formed in small amounts when chlorine is added to water.

Other names for chloroform are trichloromethane and methyl trichloride.

What happens to chloroform when it enters the environment?

- Chloroform evaporates easily into the air.
- Most of the chloroform in air breaks down eventually, but it is a slow process.
- The breakdown products in air include phosgene and hydrogen chloride, which are both toxic.
- It doesn't stick to soil very well and can travel through soil to groundwater.
- Chloroform dissolves easily in water and some of it may break down to other chemicals.
- Chloroform lasts a long time in groundwater.
- Chloroform doesn't appear to build up in great amounts in plants and animals.

How might I be exposed to chloroform?

- Drinking water or beverages made using water containing chloroform.
- Breathing indoor or outdoor air containing it, especially in the workplace.
- Eating food that contains it.
- Skin contact with chloroform or water that contains it, such as in swimming pools.

How can chloroform affect my health?

Breathing about 900 parts of chloroform per million parts air (900 ppm) for a short time can cause dizziness, fatigue, and headache. Breathing air, eating food, or drinking water containing high levels of chloroform for long periods of time may damage your liver and kidneys. Large amounts of chloroform can cause sores when chloroform touches your skin.

It isn't known whether chloroform causes reproductive effects or birth defects in people.

Animal studies have shown that miscarriages occurred in rats and mice that breathed air containing 30 to 300 ppm chloroform during pregnancy and also in rats that ate chloroform during pregnancy. Offspring of rats and mice that breathed chloroform during pregnancy had birth defects. Abnormal sperm were found in mice that breathed air containing 400 ppm chloroform for a few days.

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences



CS265956-A

Chloroform

CAS # 67-66-3

How likely is chloroform to cause cancer?

The Department of Health and Human Services (DHHS) has determined that chloroform may reasonably be anticipated to be a carcinogen.

Rats and mice that ate food or drank water with chloroform developed cancer of the liver and kidneys.

Is there a medical test to show whether I've been exposed to chloroform?

Although the amounts of chloroform in the air that you exhale and in blood, urine, and body tissues can be measured, there is no reliable test to determine how much chloroform you have been exposed to or whether you will experience any harmful effects.

The measurement of chloroform in body fluids and tissues may help to determine if you have come into contact with large amounts of chloroform, but these tests are useful for only a short time after you are exposed. Chloroform in your body might also indicate that you have come into contact with other chemicals.

Has the federal government made recommendations to protect human health?

The current EPA drinking water limit for total trihalomethanes, a class of chemicals that includes chloroform, is 80 micrograms per liter of water (80µg/L).

The EPA requires that spills or accidental releases of 10 pounds or more of chloroform into the environment be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set the maximum allowable concentration of chloroform in workroom air during an 8-hour workday in a 40-hour workweek at 50 ppm.

Glossary

Carcinogenicity: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Ingesting: Taking food or drink into your body.

Microgram (µg): One millionth of a gram.

Miscarriage: Pregnancy loss.

ppm: Parts per million.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological Profile for Chloroform. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This fact sheet answers the most frequently asked health questions (FAQs) about 1,2-dichloroethene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to 1,2-dichloroethene occurs mainly in workplaces where it is made or used. Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired. *cis*-1,2-Dichloroethene has been found in at least 146 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA). *trans*-1,2-Dichloroethene was found in at least 563 NPL sites. 1,2-Dichloroethene was found at 336 sites, but the isomer (*cis*- or *trans*-) was not specified.

What is 1,2-dichloroethene?

(Pronounced 1,2-dī-klôr' ô-ěth'ēn)

1,2-Dichloroethene, also called 1,2-dichloroethylene, is a highly flammable, colorless liquid with a sharp, harsh odor. It is used to produce solvents and in chemical mixtures. You can smell very small amounts of 1,2-dichloroethene in air (about 17 parts of 1,2-dichloroethene per million parts of air [17 ppm]).

There are two forms of 1,2-dichloroethene; one is called *cis*-1,2-dichloroethene and the other is called *trans*-1,2-dichloroethene. Sometimes both forms are present as a mixture.

What happens to 1,2-dichloroethene when it enters the environment?

- ☐ 1,2-Dichloroethene evaporates rapidly into air.
- ☐ In the air, it takes about 5-12 days for half of it to break down.
- ☐ Most 1,2-dichloroethene in the soil surface or bodies of water will evaporate into air.
- ☐ 1,2-Dichloroethene can travel through soil or dissolve in water in the soil. It is possible that it can contaminate groundwater.
- ☐ In groundwater, it takes about 13-48 weeks to break down.

- ☐ There is a slight chance that 1,2-dichloroethene will break down into vinyl chloride, a different chemical which is believed to be more toxic than 1,2-dichloroethene.

How might I be exposed to 1,2-dichloroethene?

- ☐ Breathing 1,2-dichloroethene that has leaked from hazardous waste sites and landfills.
- ☐ Drinking contaminated tap water or breathing vapors from contaminated water while cooking, bathing, or washing dishes.
- ☐ Breathing 1,2-dichloroethene, touching it, or touching contaminated materials in the workplace.

How can 1,2-dichloroethene affect my health?

Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired; breathing very high levels can kill you.

When animals breathed high levels of *trans*-1,2-dichloroethene for short or longer periods of time, their livers and lungs were damaged and the effects were more severe with longer exposure times. Animals that breathed very high

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

levels of *trans*-1,2-dichloroethene had damaged hearts.

Animals that ingested extremely high doses of *cis*- or *trans*-1,2-dichloroethene died.

Lower doses of *cis*-1,2-dichloroethene caused effects on the blood, such as decreased numbers of red blood cells, and also effects on the liver.

The long-term (365 days or longer) human health effects after exposure to low concentrations of 1,2-dichloroethene aren't known. One animal study suggested that an exposed fetus may not grow as quickly as one that hasn't been exposed.

Exposure to 1,2-dichloroethene hasn't been shown to affect fertility in people or animals.

How likely is 1,2-dichloroethene to cause cancer?

The EPA has determined that *cis*-1,2-dichloroethene is not classifiable as to its human carcinogenicity.

No EPA cancer classification is available for *trans*-1,2-dichloroethene.

Is there a medical test to show whether I've been exposed to 1,2-dichloroethene?

Tests are available to measure concentrations of the breakdown products of 1,2-dichloroethene in blood, urine, and tissues. However, these tests aren't used routinely to determine whether a person has been exposed to this compound. This is because after you are exposed to 1,2-dichloroethene, the breakdown products in your body that are detected with these tests may be the same as those that come from exposure to other chemicals. These tests aren't available in most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum allowable level of *cis*-1,2-dichloroethene in drinking water at 0.07 milligrams per liter of water (0.07 mg/L) and *trans*-1,2-dichloroethene at 0.1 mg/L.

The EPA requires that any spills or accidental release of 1,000 pounds or more of 1,2-dichloroethene must be reported to the EPA.

The Occupational Health Safety and Health Administration (OSHA) has set the maximum allowable amount of 1,2-dichloroethene in workroom air during an 8-hour workday in a 40-hour workweek at 200 parts of 1,2-dichloroethene per million parts of air (200 ppm).

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Fertility: Ability to reproduce.

Ingest: To eat or drink something.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Solvent: A chemical that can dissolve other substances.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for 1,2-Dichloroethene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about bromoform and dibromochloromethane. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Bromoform and dibromochloromethane are formed as by-products when chlorine is added to water supply systems. High levels of bromoform or dibromochloromethane can damage the liver and kidneys and affect the brain. Bromoform has been found in at least 140 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA). Dibromochloromethane has been found in at least 174 NPL sites.

What are bromoform and dibromochloromethane?

Bromoform and dibromochloromethane are colorless to yellow, heavy, nonflammable, liquids with a sweet odor. Small amounts are formed naturally by plants in the ocean. They are somewhat soluble in water and readily evaporate into the air. Most of the bromoform and dibromochloromethane that enters the environment is formed as byproducts when chlorine is added to drinking water to kill bacteria.

Only small quantities of bromoform and dibromochloromethane currently are produced in the United States. These chemicals were used in the past as solvents and flame retardants, or to make other chemicals, but now they are used mainly as laboratory reagents.

What happens to bromoform and dibromochloromethane when they enter the environment?

- ☐ When released to air, bromoform and dibromochloromethane are slowly broken down by reactions with other chemicals and sunlight or can be removed by rain.
- ☐ In water, these chemicals will evaporate to the air and/or be broken down slowly by bacteria.
- ☐ When released to soil, most will evaporate to the air, some will be broken down by bacteria, and some may filter into the groundwater.
- ☐ Bromoform and dibromomethane do not build up in the food chain.

How might I be exposed to bromoform and dibromochloromethane?

- ☐ The most likely way people are exposed to bromoform and dibromochloromethane is by drinking chlorinated water.
- ☐ You may breathe vapors released from chlorinated water in a swimming pool or during showering and bathing.
- ☐ Very small amounts of bromoform and dibromochloromethane may enter your body directly through your skin while bathing or swimming.
- ☐ People that live near a waste site containing bromoform or dibromochloromethane could be exposed by drinking contaminated groundwater or breathing vapors released to the air.
- ☐ Exposure could occur by breathing bromoform and dibromochloromethane in the air in or near a laboratory or factory that makes or uses these chemicals; however, this is unlikely for most people.

How can bromoform and dibromochloromethane affect my health?

Eating or breathing a large amount of bromoform slows down the normal brain activities and causes sleepiness; this tends to go away within a day. Exposure to very high amounts may cause unconsciousness and even death. No studies are available about health effects in people exposed to dibromochloromethane.

Animals exposed to high amounts of bromoform or dibromochloromethane developed liver and kidney injuries. Exposure to low levels of bromoform or

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

dibromochloromethane do not appear to seriously affect the brain, liver, or kidneys. We do not know if bromoform or dibromochloromethane affect fertility in humans, but studies in animals suggest that the risk of doing so is low.

How likely are bromoform and dibromochloromethane to cause cancer?

There is no conclusive evidence that bromoform or dibromochloromethane cause cancer in humans because no cancer studies of humans exposed exclusively to these chemicals are available. Studies in animals indicate that long-term intake of either bromoform or dibromochloromethane can cause liver and kidney cancer.

The International Agency for Research on Cancer (IARC) concluded that bromoform and dibromochloromethane are not classifiable as to human carcinogenicity. The EPA classified bromoform as a probable human carcinogen and dibromochloromethane as a possible human carcinogen.

How can bromoform and dibromochloromethane affect children?

The only information regarding effects of bromoform on the health of children is that from the early 1900s when this chemical was used as a sedative to treat children with whooping cough. In some cases of overdosing with extremely high doses, children appeared drowsy, then lifeless, just before dying. We do not know whether children are more susceptible to the effects of bromoform and dibromochloromethane than adults.

How can families reduce the risks of exposure to bromoform and dibromochloromethane?

- ☐ Families can reduce their exposure to bromoform and dibromochloromethane from tap water by installing commercially available filter systems at home.
- ☐ While bromoform is no longer used as a medicine, keeping children away from, or supervising children with, chemicals brought into the home, will reduce the potential for accidental exposures.

- ☐ Families can reduce their exposure by taking shorter baths or showers in water in which these chemicals are present and opening bathroom windows or using ceiling ventilation fans whenever possible.

Is there a medical test to determine whether I've been exposed to bromoform and dibromochloromethane?

Tests are available to measure levels of these chemicals and their breakdown products in samples of your blood, breath, or fat. These tests are not routinely available in a doctor's office because they require special equipment. Because bromoform and dibromochloromethane are eliminated from the body fairly quickly, these tests are only effective in detecting recent exposures (within 1 or 2 days at the most).

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water contain no more than 0.7 parts per million (0.7 ppm) of bromoform and 0.7 ppm of dibromochloromethane.

The Occupational Safety and Health Administration (OSHA) set a limit of 0.5 ppm for the level of bromoform in workplace air during an 8-hour workday, 40-hour work week. Because dibromochloromethane has such a limited use, OSHA has not set limits of exposure for workplace air.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Bromoform and Dibromochloromethane (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



Tetrachloroethylene - ToxFAQs™

CAS # 127-18-4

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?

(Pronounced tět'rə-klôr'ō-ěth'ə-lēn')

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene (PERC), PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethylene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences



CS249955-AH

Tetrachloroethylene

CAS # 127-18-4

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be performed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogenicity: The ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

This ToxFAQs™ information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

What happens to trichloroethylene when it enters the environment?

- Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.
- Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.
- Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.
- Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- Trichloroethylene does not build up significantly in plants and animals.

How might I be exposed to trichloroethylene?

- Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.

- Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.
- Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.
- Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

Trichloroethylene

CAS # 79-01-6

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is “reasonably anticipated to be a human carcinogen.” The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is “probably carcinogenic to humans.”

Is there a medical test to show whether I’ve been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn’t available at most doctors’ offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: The ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

Solvent: A chemical that dissolves other substances.

References

This ToxFAQs™ information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

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**Bureau of
Environmental Health
Health Assessment Section**

"To protect and improve the health of all Ohioans"

1,2-Dichloroethene

(also called **cis- and trans- 1,2 DCE**)

Answers to Frequently Asked Health Questions

What is 1,2 DCE?

1,2-Dichloroethene (1,2 DCE) is a highly-flammable, chlorinated, colorless liquid that has a sharp, harsh odor. There are no known products you can buy that contain 1,2 DCE. 1,2 DCE is used when mixing other chlorinated chemicals and is most often used to produce chemical solvents.

How does 1,2 DCE enter the environment?

1,2 DCE is released to the environment from chemical factories that make or use this chemical, from landfills and hazardous waste sites that have a spill or leak, from chemical spills, from burning vinyl and from the chemical breakdown of other chlorinated chemicals in the underground drinking water (groundwater).

What happens to 1,2 DCE when it enters the environment?

Air: When spilled on moist soils or in rivers, lakes and other bodies of water, most of the 1,2 DCE quickly evaporates into the air. 1,2 DCE quickly breaks down by reacting with the sunlight. In the air, it usually takes about 5-12 days for half of any amount spilled to break down.

Water: The 1,2 DCE found below soil surfaces in landfills or hazardous waste sites may dissolve in water during rain events and leak deeper in the soils, possibly contaminating the groundwater. Once in groundwater, it takes about 13-48 weeks for half of any amount spilled to break down.

Soils: Some 1,2 DCE trapped under ground may escape as soil-gas vapors. These vapors can travel through soils, especially if the soils are sandy and loose or have a lot of cracks (fissures). The vapors can then enter a home through cracks in the foundation or into a basement with a dirt floor or concrete slab. 1,2 DCE in groundwater will eventually break down into vinyl chloride and other chemicals, some of which are more hazardous to people than the 1,2 DCE.



How can I be exposed to 1,2 DCE?

People who live in cities or suburbs are more likely to be exposed to 1,2 DCE than people living in rural areas. Most people who are exposed through air or water are exposed to very low levels, in the parts per billion (ppb) range.

Notes: "ppb" is a unit of measurement. Example: 1 part per billion (1 ppb) would be equal to having one bean in a pile of one billion beans.

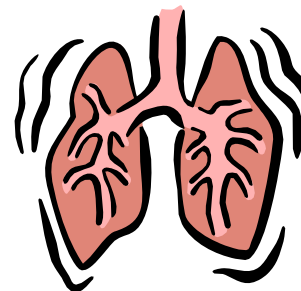
Human exposure to 1,2 DCE usually happens where the chemical has been improperly disposed of or spilled. Exposure mainly happens by breathing contaminated air or drinking contaminated water. If the water in your home is contaminated, you could also be breathing 1,2 DCE vapors while cooking, bathing or washing dishes.

The people who are most likely to be exposed to 1,2 DCE are people who work at factories where this chemical is made or used, people who work at a 1,2 DCE contaminated landfill, communities that live near contaminated landfills and hazardous waste sites.

How does 1,2 DCE enter and leave my body?

Most 1,2 DCE enters the body through your lungs when you breathe contaminated air (inhalation), through your stomach and intestines when you eat contaminated food or water (ingestion), or through your skin upon contact with the chemical (dermal).

Once breathed or swallowed, it enters your blood rapidly. Once in your blood, it travels throughout your body. When it reaches your liver it changes into several other breakdown chemicals. Some of these chemicals are more harmful than 1,2 DCE.



Can 1,2 DCE make me sick?

Yes, you can get sick from exposure to 1,2 DCE. However, getting sick will depend on many factors such as:

- How much you were exposed to (dose).
- How long you were exposed (duration).
- How often you were exposed (frequency).
- How toxic is the chemical of concern.
- General Health, Age, Lifestyle
Young children, the elderly and people with chronic (on-going) health problems are more at risk to chemical exposures.

How can exposure to 1,2 DCE affect my health?

Most information about exposure to 1,2 DCE is from occupational studies where workers were exposed at very high levels. Most environmental exposures to 1,2 DCE are at much lower than those in the workplace.

The short-term occupational studies of workers exposed to breathing high levels of 1,2 DCE found workers became nauseous (upset stomach) and drowsy/tired.

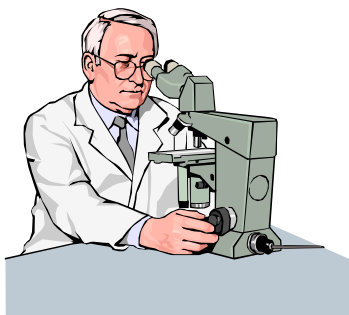
The long-term human health effects after exposure to low concentrations of 1,2 DCE are not known.

Will exposure to 1,2 DCE cause cancer?

The U.S. EPA classifies 1,2 DCE as a Class D carcinogen. The U.S. EPA Class D category is used when the chemical is not classifiable to its human carcinogenicity (ability to cause cancer). This classification is made because there is no solid data that this chemical causes cancer in humans or animals.

Is there a test to find out if I have been exposed to 1,2 DCE?

Tests are available to measure concentrations of 1,2 DCE in blood, urine and tissues. However, these tests aren't normally used to determine whether a person has been exposed to this compound. This is due to the fact that after you are exposed to 1,2 DCE, the breakdown products in your body that are detected with these tests may be the same as those that come from exposure to other chemicals. These tests aren't available in most doctors' offices, but can be done at special laboratories that have the right equipment.



What recommendations has the federal government made to protect human health?

The federal government has developed regulatory standards and guidelines to protect people from possible health effects of 1,2 DCE in water and air.

Water: The EPA has established water quality guidelines to protect both aquatic life and people who eat fish and shellfish. The EPA Office of Drinking Water has set a drinking water regulation that states that water delivered to any user of a public water system shall not exceed 70 ppb for cis-1,2 DCE and 100 ppb trans-1,2 DCE. For very short-term exposures (1 day) for children, EPA advises that concentrations in drinking water should not be more than 4 ppm for cis-1,2 DCE or 20 ppm for trans-1,2 DCE. For 10-day exposures for children, EPA advises that drinking water concentrations should not be more than 3 ppm for cis-1,2 DCE or 2 ppm for trans-1,2 DCE. For industrial or waste disposal sites, any release of 1,000 pounds or more must be reported to the EPA.

Air: The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) have established guidelines for occupational exposure to cis- or trans-1,2 DCE. Average concentrations should not exceed 200 ppm in the air.

References:

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. Toxicological profile for 1,2-Dichloroethene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

U.S. Environmental Protection Agency, Integrated Risk Information System, II.A.1. Weight-of-Evidence Characterization

Where Can I Get More Information?

Ohio Department of Health
Bureau of Environmental Health
Health Assessment Section
246 N. High Street
Columbus, Ohio 43215
Phone: (614) 466-1390



The Ohio Department of Health is in cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), Public Health Service, U.S. Department of Health and Human Services.

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**Bureau of
Environmental Health
Health Assessment Section**

"To protect and improve the health of all Ohioans"

Tetrachloroethylene (PERC)

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene.

What is tetrachloroethylene (PERC)?

Tetrachloroethylene (PERC) is a man-made chemical that is widely used for dry cleaning clothes and for metal degreasing. It is also used to make other chemicals and can be found in some household products such as water repellents, silicone lubricants, fabric finishers, spot removers, adhesives and wood cleaners. It evaporates easily into the air and has a sharp, sweet odor. PERC is a nonflammable (does not burn) liquid at room temperature.

How does tetrachloroethylene (PERC) get into the environment?

Tetrachloroethylene (PERC) can evaporate into the air during dry cleaning operations and during industrial use. It can also be released in air if it is not properly stored or was spilled. If it was spilled or leaked into the soil, it may be found in groundwater (or underground drinking water).

People can be exposed to tetrachloroethylene (PERC) from the environment, from household products, from dry cleaning products and from their occupation (work). Common environmental levels of tetrachloroethylene



(called background levels) can be found in the air we breathe, in the water we drink and in the food we eat. In general, levels in the air are higher in the cities or around industrial areas where it is used more than rural or remote areas.

The people with the greatest chance of exposure to tetrachloroethylene are those who work with it. According to estimates from a survey conducted by the National Institute for Occupational Safety and Health (NIOSH), more than 650,000 U.S. workers may be exposed. However, the air close to dry cleaning business and industrial sites may have levels of tetrachloroethylene higher than background levels. If the dry cleaning business or industry has spilled or leaked PERC on the ground, there may also be contaminated groundwater as well.

What happens to tetrachloroethylene (PERC) in the environment?

Much of the tetrachloroethylene (PERC) that gets into surface waters or soil evaporates into the air.

However, some of the PERC may make its way to the groundwater.

Microorganisms can break down some of the PERC in soil or underground water.

In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain. PERC does not appear to collect in fish or other animals that live in water.



How can tetrachloroethylene (PERC) enter and leave your body?

Tetrachloroethylene (PERC) can enter your body when you breathe contaminated air or when you drink water or eat food containing the chemical. If PERC is trapped against your skin, a small amount of it can pass through into your body. Very little PERC in the air can pass through your skin into your body. Breathing contaminated air and drinking water are the two most likely ways people will take in PERC. How much enters your body in this way depends on how much of the chemical is in the air, how fast and deeply you are breathing, how long you are exposed to it or how much of the chemical you eat or drink.

Most PERC leaves your body from your lungs when you breathe out. This is true whether you take in the chemical by breathing, drinking, eating, or touching it. A small amount is changed by your body (in your liver) into other chemicals that are removed from your body in urine. Most of the changed (PERC) leaves your body in a few days. Some of it that you take in is found in your blood and other tissues, especially body fat. Part of the tetrachloroethylene that is stored in fat may stay in your body for several days or weeks before it is eliminated.

Can tetrachloroethylene (PERC) make you sick?

Yes, you can get sick from contact with PERC. But getting sick will depend upon:

- How much you were exposed to (dose).
- How long you were exposed (duration).
- How often you were exposed (frequency).
- General Health, Age, Lifestyle Young children, the elderly and people with chronic (on-going) health problems are more at risk to chemical exposures.

How can tetrachloroethylene (PERC) affect my health?

Exposure to very high concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Skin irritation may result from repeated or extended contact with it as well. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high." Normal background levels (or common environmental levels) will not cause these health affects.

Is tetrachloroethylene (PERC) a carcinogen (cause cancer)?

In the United States, the National Toxicology Program (NTP) releases the *Report on Carcinogens* (RoC) every two years. The NTP is formed from parts of several different government agencies, including the National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC), and the Food and Drug Administration (FDA). The *Report on Carcinogens* (RoC) identifies two groups of agents: "Known to be human carcinogens" & "Reasonably anticipated to be human carcinogens."

Tetrachloroethylene (PERC) has been shown to cause liver tumors in mice and kidney tumors in male rats. The RoC has determined that PERC may reasonably be anticipated to be a carcinogen.

Reference:

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. [Toxicological Profile for tetrachloroethylene](#). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service

Is there a medical test to show whether you have been exposed to tetrachloroethylene (PERC)?

One way of testing for tetrachloroethylene (PERC) exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood. Because PERC it is stored in the body's fat and slowly released into the bloodstream, it can be detected in the breath for weeks following a heavy exposure. Also, PERC and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform but are not available at most doctors' offices and must be done at special laboratories that have the right equipment. Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to PERC or the other chemicals that produce the same breakdown chemicals.

What has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

The Ohio Department of Health is in cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), Public Health Service, U.S. Department of Health and Human Services.

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**Bureau of
Environmental Health
Health Assessment Section**

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Trichloroethylene (TCE)

(try- klor'oh eth'uh- leen)

Answers to Frequently Asked Health Questions

What is TCE?

TCE is a man-made chemical that is not naturally found in the environment. TCE is a non-flammable (does not burn), colorless liquid with a somewhat sweet odor and sweet, "burning" taste. It is mainly used as a cleaner in industry to remove grease from metal parts. TCE can also be found in common household items such as glues, paint removers, typewriter correction fluids and spot removers.

The biggest source of TCE in the environment comes from evaporation (changing from a liquid into a vapor/gas) when industries use TCE to remove grease from metals or when we use common household products that contain TCE. It can also contaminate soils and groundwater (underground drinking water) as the result of spills or improper disposal.

What happens to TCE in the environment?

- Upon contact with the air, TCE quickly evaporates and breaks down in the sunlight and oxygen.
- TCE quickly evaporates from the surface waters of rivers, lakes, streams, creeks and puddles.
- If large amounts of TCE are spilled on the ground, some of it will evaporate and some of it may leak down into the soils. When it rains, TCE can be carried through the soils and into the groundwater (drinking water).
- When TCE-contaminated groundwater is in an anaerobic (without oxygen) environment and with time, it will break down into different chemicals such as 1,2 Dichloroethene (1,2 DCE) and Vinyl Chloride (VC).
- TCE does not build up in plants and animals.
- TCE found in foods is believed to come from TCE contaminated water used in food processing or from food processing equipment cleaned with TCE.

How does TCE get into your body?

- **Breathing (Inhalation):** TCE can get into your body by breathing air contaminated with TCE vapors. The vapors can be released from the industrial use of TCE, from using household products that contain TCE, or by TCE contaminated water evaporating in the shower.
- **Drinking (Ingestion):** TCE can get into your body by drinking TCE contaminated water.
- **Skin (Dermal):** Small amounts of TCE can get into your body through skin contact. This can take place when using TCE as a cleaner-degreaser or by contact with TCE contaminated soils.

Can TCE make you sick?

Yes, you can get sick from TCE. But getting sick will depend on the following:

- How much you were exposed to (dose).
- How long you were exposed (duration).
- How often you were exposed (frequency).
- General Health, Age, Lifestyle Young children, the elderly and people with chronic (on-going) health problems are more at risk to chemical exposures.

How does TCE affect your health?

Breathing (Inhalation):

- Breathing high levels of TCE may cause headaches, lung irritation, dizziness, poor coordination (clumsy) and difficulty concentrating.
- Breathing very high levels of TCE for long periods may cause nerve, kidney and liver damage.

Drinking (Ingestion):

- Drinking high concentrations of TCE in the water for long periods may cause liver and kidney damage, harm the immune system and damage fetal heart development in pregnant women.
- It is uncertain whether drinking low levels of TCE will lead to adverse health effects.

Skin (Dermal) Contact:

- Short periods of skin contact with high levels of TCE may cause skin irritation and rash.



Does TCE cause cancer?

In September of 2011 the U.S. EPA revised their Integrated Risk Information System (IRIS) numbers for cancer and non-cancer effects for Trichloroethylene (TCE). The U.S. EPA newly revised IRIS document has classified TCE as "carcinogenic to humans." This classification is used when there is evidence between human exposure and cancer.

The National Toxicology Program's 12th Report on Carcinogens list TCE as *Reasonably Anticipated to be a Human Carcinogen*. **NOTE:** The 12th Report on Carcinogens was released prior to the release of the new EPA IRIS revision. It is likely the next Report on Carcinogens will reflect the EPA IRIS number changes.

Is there a medical test to show whether you have been exposed to TCE?

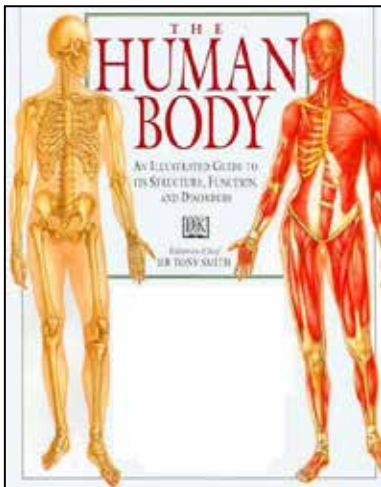
Yes, medical testing is available to determine recent exposure(s).

- TCE can be measured in your breath, but only if you have been exposed to **large** amounts (part per million -- ppm levels).
- Blood or urine samples can also be used, but only if you have been exposed to **large** amounts (part per million -- ppm levels).

TCE in the human body:

When chemicals enter the human body, they typically get broken down and eliminated through normal bodily functions. Some of the break down products (called metabolites) of TCE can be measured in your blood or urine. However, some of the same metabolites in your blood and urine can also be produced as a result of exposure to similar chemicals and other sources (diet, medications, environment, etc.). For this reason, blood and urine testing is not always an accurate measure of exposure to TCE.

It is important to note TCE and TCE's metabolites usually leave the body shortly after exposure, so the testing would only be useful for recent exposures. Also, testing may not be useful or reliable in determining whether people have been exposed to low-doses of TCE or whether they will experience any harmful health effects.



Has the federal government made recommendations to protect human health?

The federal government develops regulations and recommendations to protect public health and these regulations can be enforced by law.

Recommendations and regulations are periodically updated as more information becomes available. Some regulations and recommendations for TCE follow:

- ✓ On 09/28/2011 the U.S. EPA revised their Integrated Risk Information System (IRIS) numbers for Trichloroethylene (TCE) (CASRN 79-01-6) -- see below reference section for link --
- The Environmental Protection Agency (EPA) has set a maximum contaminant level (MCL) for TCE in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5.0 parts of TCE per billion parts water (5.0 ppb).
- The Occupational Safety and Health Administration (OSHA) have set an exposure limit of 100 ppm (or 100 parts of TCE per million parts of air) for a healthy adult, 8-hour workday, 40-hour workweek.
- The EPA has developed regulations for the handling and disposal of TCE.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological profile for TCE (electronic at) <http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=173&tid=30>

Report on Carcinogens, Twelfth Edition; U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, 2011 (electronic at) <http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf>

U.S. EPA Integrated Risk Information System (IRIS) for Trichloroethylene (TCE) (CASRN 79-01-6) <http://www.epa.gov/iris/subst/0199.htm>

The Ohio Department of Health is in cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), Public Health Service, U.S. Department of Health and Human Services.

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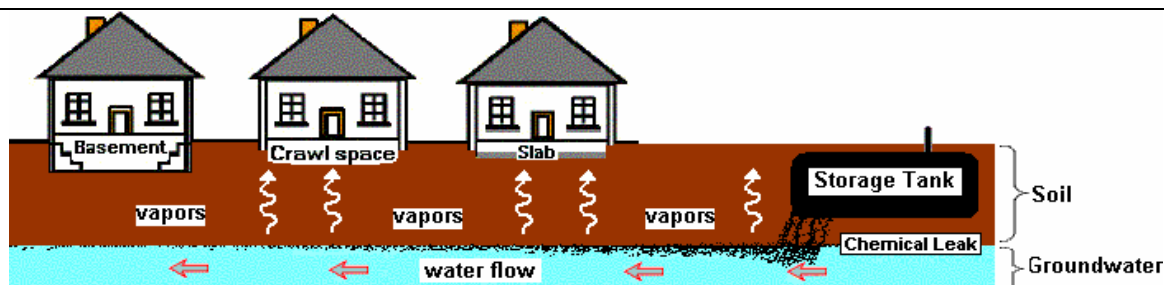


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Vapor Intrusion

Answers to Frequently Asked Health Questions



What is vapor intrusion?

Vapor intrusion refers to the vapors produced by a chemical spill/leak that make their way into indoor air. When chemicals are spilled on the ground or leak from an underground storage tank, they will seep into the soils and will sometimes make their way into the groundwater (underground drinking water). There are a group of chemicals called volatile organic compounds (VOCs) that easily produce vapors. These vapors can travel through soils, especially if the soils are sandy and loose or have a lot of cracks (fissures). These vapors can then enter a home through cracks in the foundation or into a basement with a dirt floor or concrete slab.

VOCs and vapors:

VOCs can be found in petroleum products such as gasoline or diesel fuels, in solvents used for industrial cleaning and are also used in dry cleaning. If there is a large spill or leak resulting in soil or groundwater contamination, vapor intrusion may be possible and should be considered a potential public health concern that may require further investigation.

Although large spills or leaks are a public health concern, other sources of VOCs are found in everyday household products and are a more common source of poor indoor air quality. Common products such as paint, paint strippers and thinners, hobby supplies (glues), solvents, stored fuels (gasoline or home heating fuel), aerosol sprays, new carpeting or furniture, cigarette smoke, moth balls, air fresheners and dry-cleaned clothing all contain VOCs.



Can you get sick from vapor intrusion?

You can get sick from breathing harmful chemical vapors. But getting sick will depend on:

How much you were exposed to (dose).

How long you were exposed (duration).

How often you were exposed (frequency).

How toxic the spill/leak chemicals are.

General Health, age, lifestyle: Young children, the elderly and people with chronic (on-going) health problems are more at risk to chemical exposures.

VOC vapors at high levels can cause a strong petroleum or solvent odor and some persons may experience eye and respiratory irritation, headache and/or nausea (upset stomach). These symptoms are usually temporary and go away when the person is moved to fresh air.

Lower levels of vapors may go unnoticed and a person may feel no health effects. A few individual VOCs are known carcinogens (cause cancer). Health officials are concerned with low-level chemical exposures that happen over many years and may raise a person's lifetime risk for developing cancer.

How is vapor intrusion investigated?

In most cases, collecting soil gas or groundwater samples near the spill site is done first to see if there is on-site contamination. If soil vapors or groundwater contamination are detected at a spill site, environmental protection and public health officials may then ask that soil vapor samples be taken from areas outside the immediate spill site and near any potential affected business or home. The Ohio Department of Health (ODH) does not usually recommend indoor air sampling for vapor intrusion before the on-site contamination is determined.

(continued on next page)

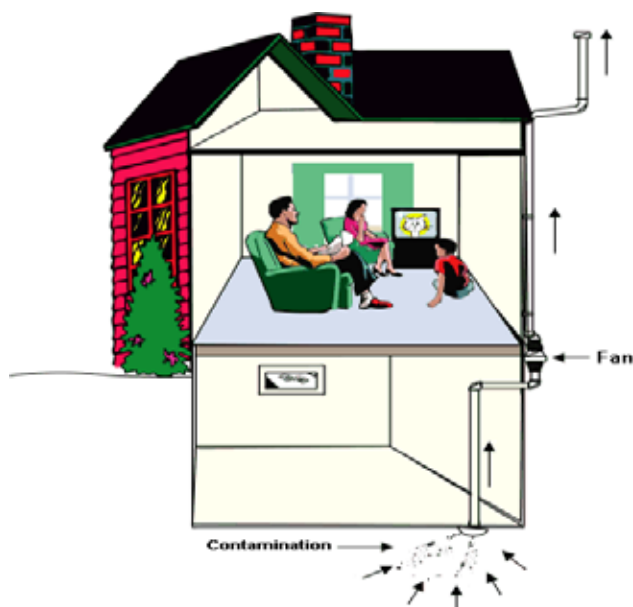
How is vapor intrusion investigated? (continued)

Because a variety of VOC sources are present in most homes, testing will not necessarily confirm VOCs in the indoor air are from VOC contamination in soils at nearby spill site. But if additional sampling is recommended, samples may be taken from beneath the home's foundation (called sub-slab samples), to see if vapors have reached the home. Sub-slab samples are more reliable than indoor air samples and are not as affected by other indoor chemical sources. If there was a need for additional sampling on a private property, homeowners would be contacted by the cleanup contractor or others working on the cleanup site and their cooperation and consent would be requested before any testing/sampling would be done.

What happens if a vapor intrusion problem is found?

If vapor intrusion is having an effect on the air in your home, the most common solution is to install a *radon mitigation system*. A radon mitigation system will prevent gases in the soil from entering the home. A low amount of suction is applied below the foundation and the vapors are vented to the outside. The system uses minimal electricity and should not noticeably affect heating and cooling efficiency. This mitigation system also prevents radon from entering the home, an added health benefit. Usually, the party responsible for cleaning up the contamination is also responsible for paying for the installation of this system. Once the contamination is cleaned up, the system should no longer be needed. In homes with on going radon problems, ODH suggests these systems remain in place permanently.

Radon Mitigation System



Created September 2004

What can you do to improve your indoor air quality?

As stated before, the most likely source of VOCs in indoor air comes from the common items that are found in most homes. The following helpful hints will help improve air quality inside your home:

- ❖ Do not buy more chemicals than you need and know what products contain VOCs.
- ❖ If you have a garage or an out building such as a shed, place the properly stored VOC-containing chemicals outside and away from your family living areas.
- ❖ Immediately clean and ventilate any VOC spill area.
- ❖ If you smoke, go outside and/or open the windows to ventilate the second-hand, VOC-containing smoke outdoors.
- ❖ Make sure all your major appliances and fireplace(s) are in good condition and not leaking harmful VOC vapors. Fix all appliance and fireplace leaks promptly, as well as other leaks that cause moisture problems that encourage mold growth.
- ❖ Most VOCs are a fire hazard. Make sure these chemicals are stored in appropriate containers and in a well-ventilated location and away from an open pilot light (flame) of a gas water heater or furnace.
- ❖ Fresh air will help prevent both build up of chemical vapors in the air and mold growth. Occasionally open the windows and doors and ventilate.
- ❖ Test your home for radon and install a radon detector.

References:

Wisconsin Department of Health and Family Services, Environmental Health Resources, Vapor Intrusion, electronic, 2004.

New York State Department of Health, Center for Environmental Health, April 2003.

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